JANUARY, 1956

Traffic Engineering

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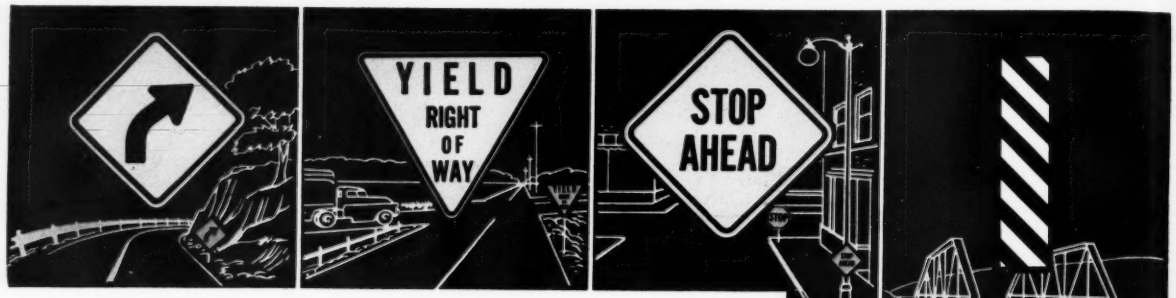
- Intersection Capacity
- Use of Yield Signs
- How to Organize and Write Effective Technical Reports
- Planning for Shopping

Official Publication of the Institute of Traffic Engineers



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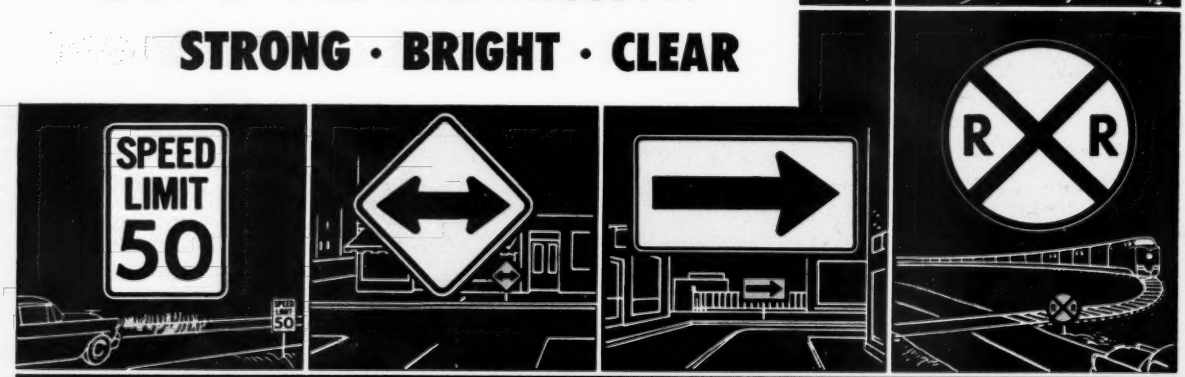

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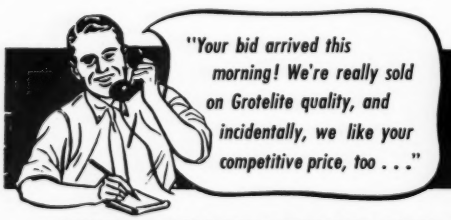
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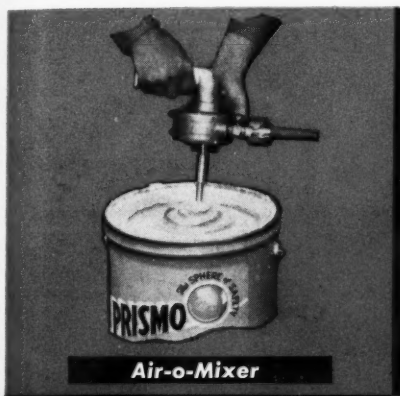

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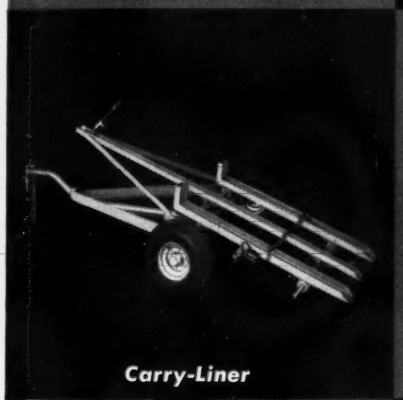

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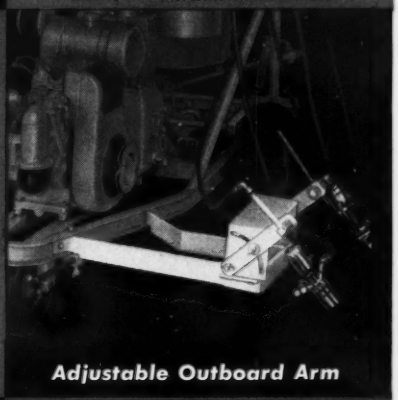

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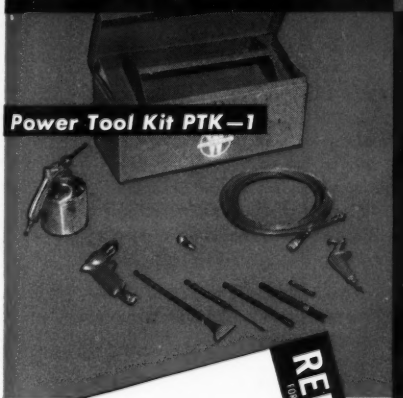

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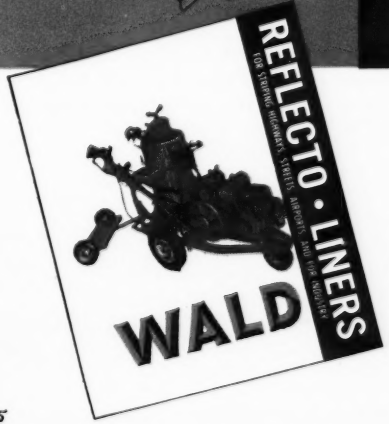

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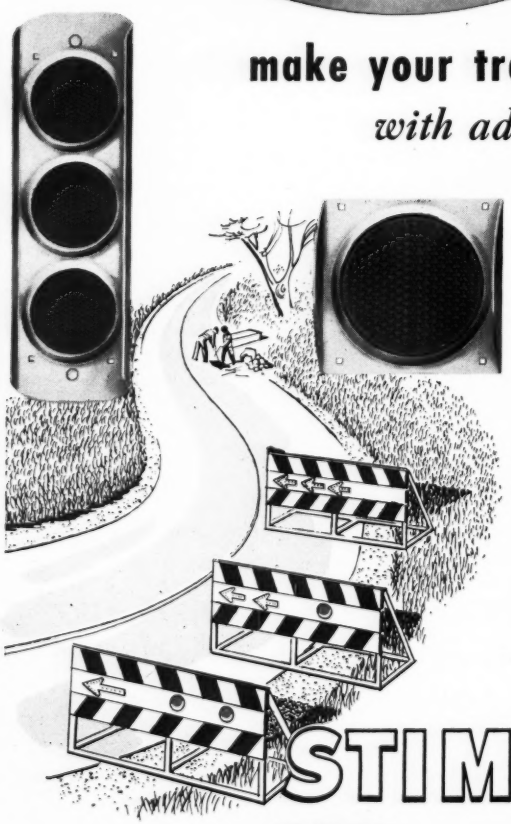

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Traffic Engineering

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COVER: This aerial view shows the famous 4-level interchange facility at the intersection of two state highways in Los Angeles, California. More than a quarter of a million (257,000) vehicles enter this interchange each day with a peak hour volume of 23,000, including 9500 right and left turns. Cars moving to the right on famed Sunset Boulevard (surface street from left to right in foreground) are headed toward even more famous Hollywood. The Hollywood Freeway (left to right, top level) crosses the Harbor Freeway (center) which leads away toward Wilshire Boulevard and Pasadena harbor, far beyond camera range. A portion of the Los Angeles down-town district appears in the upper left corner. Note semi-express street left of Harbor Freeway.

DEFINITION: Traffic Engineering is that phase of engineering which deals with the planning and geometric design of streets, highways, and abutting lands, and with traffic operation thereon, as their use is related to the safe, convenient, and economic transportation of persons and goods.

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Frankly Speaking

THE TRAFFIC ENGINEER who is looking ahead can see the day coming when he will be working only at a fraction of his potential efficiency because of the lack of modern techniques and modern tools. This situation arises and will become worse before relief is provided because the Traffic Engineer is too busy in his operating capacity to do the necessary research to provide these modern techniques.

With few notable exceptions the techniques and material that we are working with today were devised two decades ago, and we are so busy working with admittedly inadequate methods and tools that we have no time to improve either. We are in a morass, and as our daily tasks pile higher and higher, we are sinking deeper and deeper into the morass. We need help, quickly; intelligent help, in abudance. It will be costly.

Traffic Engineers know how to do the research which is so necessary. It isn't a question of talent, although we need more people in this field. It is simply a matter of time; or, to put it more adequately, lack of time. We are too busy operating. Without exception, our day-to-day tasks occupy our entire attention. There just aren't enough hours for those of us engaged in Traffic Engineering to accomplish our immediate operating functions and engage in research too.

The operating and research functions of Traffic Engineering will have to be separated, physically, and without further delay if we are to avoid complete stultification in our profession. This will require more trained personnel; the ranks of the operating engineers who move into the research field will have to be filled. Other professions have led the way in the direction we must take. Medical doctors and dentists work constantly with new techniques and new materials developed by the research branches of their professions. The electrical engineer works from day to day with the newest of research developments. Power from nuclear reactors will be available for all, and for a variety of useful purposes, in a very few years—because research in that field has progressed rapidly under a well-financed program. Unless Traffic Engineering is to bog down ingloriously at a tremendous and wholly unthinkable cost to the transportation industry, we must pursue the same course that other scientific professions have pioneered.

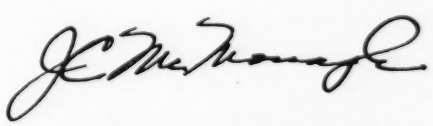
To accomplish the necessary engineering research money must be provided. One possibility is legislative grants. The State of Michigan recently made a significant start in this direction with an appropriation for Michigan State University for establishing a highway traffic safety center which will include a Traffic Engineering research program. The University of Michigan has also established a transportation institute which includes a broad program of Traffic Engineering research.

There are universities and colleges in every state which can provide the opportunities for such research if funds are provided. Other sources, obviously, are private industry in the fields which have a stake in our professional activities and accomplishments; and the various foundations and endowments in the general field of public service. Still another possibility exists in our State highway departments, and perhaps, although to a lesser degree, in some of the larger municipal agencies.

Under a re-organization plan which will be activated soon, we will have a Traffic Engineering research unit in the Planning and Traffic Division of the Michigan State Highway Department. It will be a pilot effort, a small start. But it will be a beginning place, and from this start we are hopeful of gathering momentum for a serious attack on research problems. We will also work with the research people in the new state-financed project at Michigan State University as soon as it begins to move.

Finally, it should be pointed out that various committees of Institute of Traffic Engineers, the Highway Research Board, and American Association of State Highway Officials, have touched on or are touching on some of the phases of Traffic Engineering Research. But with committee members scattered far and wide over the 48 states, accomplishments must necessarily be on the modest side. The trouble again is that we are too busy with our day-to-day functions of operating a Traffic Engineering Division or Department to put in appreciable time or effort on committee work, just as we lack time for research activities by any other means.

If our profession is to survive the hectic days that are ahead of us some action must be taken immediately to provide for Traffic Engineering Research.



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Intersection Capacity

George M. Webb (Mem., ITE), Traffic Engineer
Karl Moskowitz (Mem., ITE), Assistant Traffic Engineer
California Division of Highways, Sacramento, California

THE INTERSECTION is the bottleneck. That's where the cars back up and where the delay is, and that is the reason why intersection capacity is important in connection with any capacity study.

Three aspects of intersection capacity will be discussed here:

1. Intersection capacity must be considered in the design of full freeways although there are no intersections at grade on the freeway itself;
2. Basic rates of flow at signalized intersections;
3. Actuated signals and the necessity for utilizing all the green time on each approaching leg.

Intersections and Freeways

From the standpoint of capacity, as well as delay, the highest type of intersection possible to design is one in which all conflicting movements are separated in grade and the turns are made on direct connection ramps; no loops, no stops, and minimum circuity.

The Los Angeles intersection of two state highways shown on the cover of this magazine is an example. It handles over a quarter-million cars per day. The peak hour volume entering this intersection is 23,000 vehicles of which 9,500 make either right or left turns. This is an intersection between two freeways.

In order to build up this kind of volume, there must be a multitude of connections to the surface street system, and each one of these connections constitutes at least one intersection at grade. It follows that the design and capacity of intersections at grade are very important in the proper functioning of the freeway itself.

A typical problem that arises is the discharge of a large volume from the freeway at one point. This flow from the freeway is continuous, and where it joins the city street it must generally be interrupted in order to give the street traffic a chance to move. A continuous stream is equivalent to a signal which is green all the time. When the green time is reduced, one of the simplest ways to compensate is to increase the number of lanes as illustrated in Figure 1.

One of the values we should like to have more information on is the capacity of the two-abreast left-turn movement shown in Figure 1. Based on a very limited number of observations, it appears to be about 1,000 cars per lane-hour of green yellow (see Figure 2). This figure of 1,000 is conservative and compares with a rate of 1,200 on straight-ahead movements.

If one-third of the signal go time can be assigned to the off-ramp, the hourly volume which can make the left turn shown is:

$$\underset{\text{(time)}}{\tfrac{1}{3}} \times \underset{\text{(capacity per lane)}}{1{,}000} \times \underset{\text{(No. of lanes)}}{2} = 667 \text{ cars}$$

Typically, one-third of the off-ramp traffic may desire to turn right, so that this 667 constitutes two-thirds of the ramp traffic. The ramp is then capable of handling 1,000 cars per

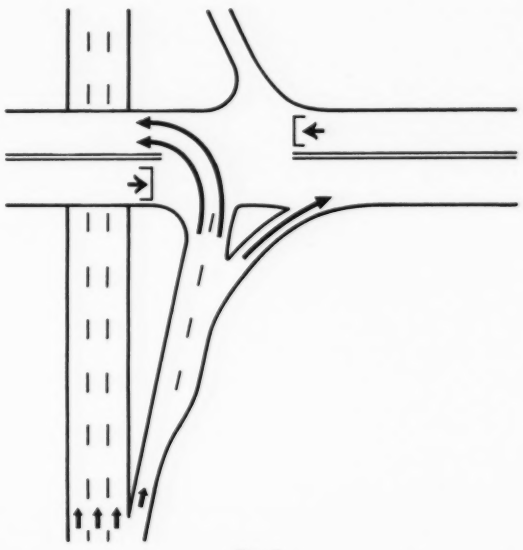


Fig. 1
Typical Intersection with 2-Abreast Left-Turn Movement.

hour at practical capacity (i.e., with no backlogging) and at the same time there will be *40 minutes of the hour for the cross street* to go. This is as much go time as the cross street is likely to have at other nearby signals. If the freeway is running at a practical capacity rate of 1,500 cars per lane-hour, two-thirds of the traffic in the right-hand lane can exit on this one ramp, leaving only one-third of a lane-full going on through the interchange in the right-hand lane.

Basic Rates of Flow at Signalized Intersections

The *Highway Capacity Manual* was published in 1950 as a result of work done during preceding years by the Com-

Fig. 2
2-Abreast Left-Turn Movement at a City Street Intersection in Sacramento, California. Volume for This Movement is 740 vehicles in 1100-seconds Green-Yellow, with some Cars Delayed more than One Cycle During Peak 15 Minutes.

Fig. 3

State Highway-County Road Intersection. This picture was snapped 10 seconds after green light flashed. Note that 9 cars have entered the intersection for an average headway of 2.1 seconds. Speed about 25 miles per hour.

mittee on Highway Capacity of the Highway Research Board under the Chairmanship of O. K. Normann. The authors would like to take this opportunity of complimenting the committee for the excellent quality of the data and thorough coverage of the subject of capacity. The *Manual* really constitutes the basic book for our profession. The values for practical capacity in the manual are quite satisfactory for design purposes, although a major deviation was found throughout this State in the so-called basic capacity of a 12-foot traffic lane entering a signalized intersection.

The manual says that this is 1,500 passenger cars per hour of green. Stated another way, 2.4 seconds is the lowest average headway between vehicles starting from a standing position. Observations in California have shown as long ago as 1949 that this headway was 2.1 seconds, and since the advent of more and more automatic transmissions, headways of two seconds or less have been observed for long portions of an hour. In other words, the basic rate seems to be about 1,800 per lane-hour of green-yellow, which would be 1,900 to 2,000 passenger cars per hour of green (see Figures 3 and 4). Possible capacity is the same as basic capacity if the intersection is properly designed for high volumes and there are no commercial vehicles, pedestrian interference, parking, or conflicting turning movements on any one phase.

Fig. 4

Same intersection as Figure 3. Picture snapped during first second of yellow indication. The 5 cars nearest intersection are moving about 40 miles per hour and went through the 4½ second yellow interval for an average headway of 1.8 seconds. This illustrates that average rate during yellow is just as high as during green.

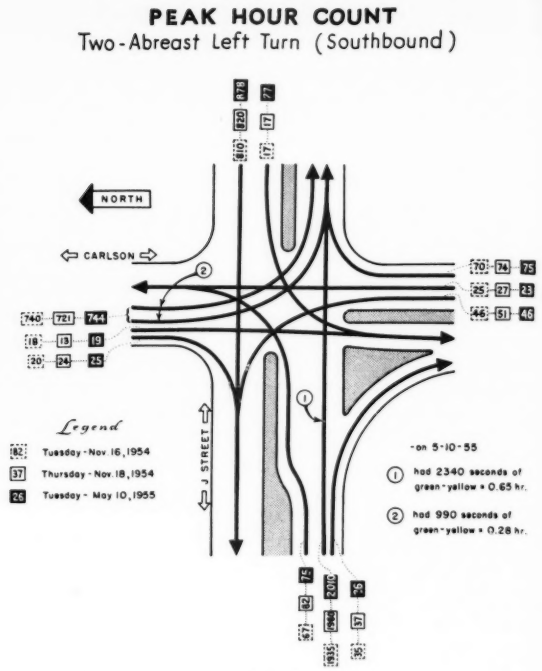

PEAK HOUR COUNT
Two-Abreast Left Turn (Southbound)
NORTH
CARLSON
J STREET
Legend
Tuesday - Nov. 16, 1954
Thursday - Nov. 18, 1954
Tuesday - May 10, 1955
- on 5-10-55
(1) had 2340 seconds of green-yellow = 0.65 hr.
(2) had 990 seconds of green-yellow = 0.28 hr.

Fig. 5

Peak hour count on three different days at the intersection of Carlson and Jay Streets.

The relationship of practical capacity to possible capacity depends more upon the fluctuation of demand within an hour than upon the degree of so-called comfort and convenience with which traffic traverses the intersection. Because of this fluctuation, the demand during the highest five minutes of an hour is around one-ninth of the total for the hour, while the time, of course, is only one-twelfth. In order to be sure that the highest five minutes will not backlog, the volume for the hour cannot exceed $9 \times 1/12$ of the possible capacity; in other words, practical capacity is about 75 percent of possible.

Green Time and Green-Yellow or Go Time

As every motorist has observed, the yellow interval *is* utilized by vehicles entering the intersection. The purpose

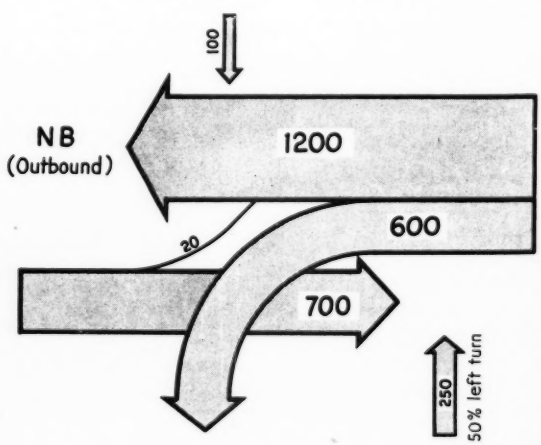


Fig. 6

Peak hour volumes at typical intersection on the fringe of a metropolitan area.

of the yellow is to allow those vehicles-which-are-too-close-to-stop to go on through (see Figure 4). When an intersection carries enough volume to be approaching capacity conditions, the average headway between the vehicles-which-are-too-close-to-stop is the same as the average headway between vehicles during any other part of the green interval. At first thought, it might seem that multiplying net green time by the rate per hour of green would result in the same answer as multiplying the total go time (green-yellow) by the rate per hour of green-yellow. The difference arises when the cycle is lengthened. Those who allow themselves to think in terms of net green time are apt to draw some absurd conclusions regarding cycle lengths. Because, of course, the longer the cycle, the smaller is the percentage of yellow time, and the greater is the green time during a clock hour.

It is true that there is a small amount of time lost at the beginning of each green interval, but calling the yellow time non-productive is the wrong way of arriving at the amount of lost time per cycle. A cycle short enough to result in a very large number of cycles during an hour would tend to reduce the volume handled, but on the other hand, if the green interval is allowed to last too long there will be some substantial gaps or stragglers in the moving stream. On a straight-ahead approach, a 40-second interval, including the yellow, will result in just as many cars per second as any longer go interval will.

From the standpoint of capacity, one of the principal reasons for lengthening a cycle is to be sure that the minor phase does run "loaded", i.e. to be sure that enough cars have been stored in each cycle to utilize the minimum green time on the minor leg, thus giving a greater percentage of the time for green on the major leg. Stated another way, it is often necessary to lengthen the cycle in order to obtain the correct *percent* allocation of green-yellow between various legs. A minor result is that lengthening the cycle reduces the amount of time lost at the beginning of the green, but not in proportion to the reduction in yellow time.

A study was made at the three-phase signal shown in Figure 2 shown previously with different settings of the controller which caused the average cycle length to change. The average cycle length of this three-phase signal was reduced from 156 seconds to 112 seconds, and the following results were noted (full hour):

	Before	*After*
No. of cycles	23	32
Vehicles on Ø A, (major leg)	1935	1957
Seconds of green yellow, Ø A	2316*	2244*
Seconds of yellow	92	128
Rate per hour of green-yellow	3000	3140
Rate per hour of green	3130	3330
Vehicles on Ø C making left turn two abreast	740	721
Seconds of green-yellow, Ø C	1100	1109
Seconds of yellow	69	96
Ø B non-overlap, sec.	190	204
Total seconds	3606	3557

* Ø B overlap Ø A on 10 cycles before, 20 times after.

Figure 5 shows the total count at this intersection.

Cumulative volume curves were plotted which showed that the cumulative volume from a zero point at the beginning of the hour was always greater with the shorter cycle. Measurements of the backlog (queue) also showed that the queues were always shorter with the shorter cycle, and that the amount of time during which each cycle failed to clear all waiting vehicles was reduced from 34 minutes to 27 minutes.

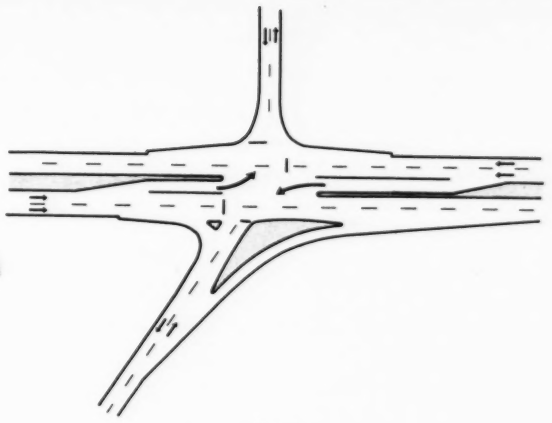


Fig. 7
Typical layout of an intersection designed to handle the volumes shown in Figure 6.

Traffic-Actuated Signals

Many State highway intersections are controlled by traffic-actuated signals. There is a more-or-less widely held idea that traffic-actuated signals have a higher capacity than pre-timed signals, but we do not have any figures to show that this is true in so far as the number of cars per hour of green-yellow is concerned. As a matter of fact, the basic capacity, based on minimum headway between vehicles, is bound to be the same with any type of signal control and depends only upon the physical characteristics of the roadways. When a motorist sees a green light he goes regardless of the type of control. However, a traffic-actuated signal is able to keep the area of conflict busy at all times rather than allowing any completely idle green time, and for this reason the total volume from all legs can be materially increased. In order to do this, all idle green time must be eliminated. This can be done only by observing the fundamental precept:

"Keep the conflict area busy."

To illustrate this, a typical example which seems to occur on the fringes of all our metropolitan areas will be cited.

Figure 6 shows the evening peak hour volumes at such an intersection. There is a very large left-turn movement

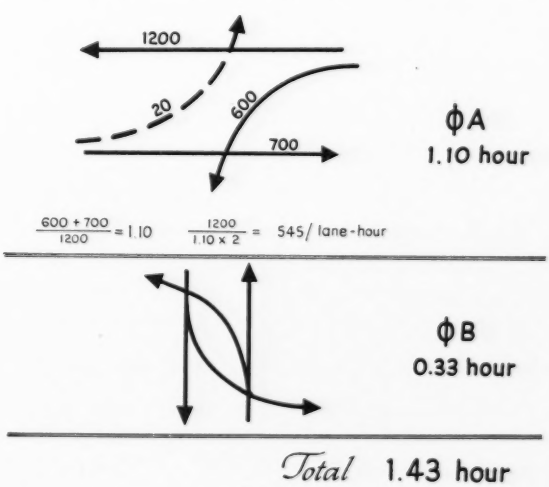


Fig. 8
Typical 2-phase signal system at intersection shown in Figure 7.

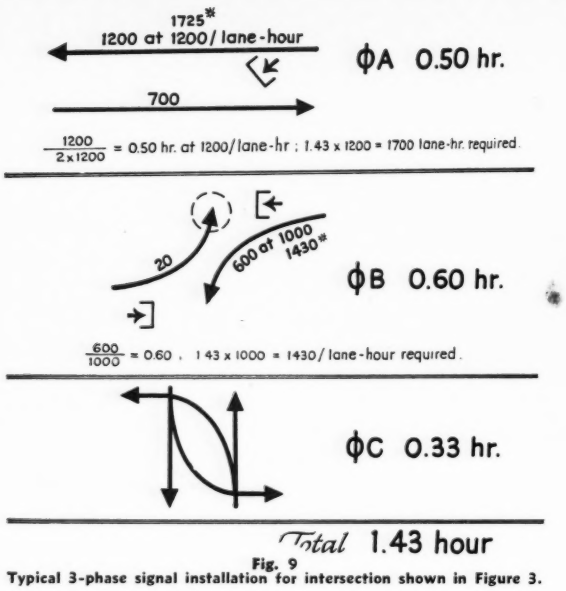


Fig. 9
Typical 3-phase signal installation for intersection shown in Figure 3.

coincident with the major leg, which for identification we will call northbound.

Figure 7 is a typical layout of an intersection designed to handle the volumes shown in Figure 6. There is a median storage lane for each left-turn movement; the main line goes two abreast in each direction, and the cross road has a one-lane approach.

If a two-phase signal were used at this intersection, the conflict in Phase A of the 600 left turns and 700 opposing southbound movement will require at least 1.10 hours of green-yellow and inasmuch as Phase B requires .33 of an hour, a total of 1.43 hours is required to handle this volume (see Figure 8). However, we would never ask a California motorist to fight his way through such a conflict as the 600 and 700 shown here during Phase A.

Figure 9 is the phase diagram for a typical three-phase signal installation in which the through traffic goes during Phase A, the left turns in Phase B, and the cross street on

Fig. 6

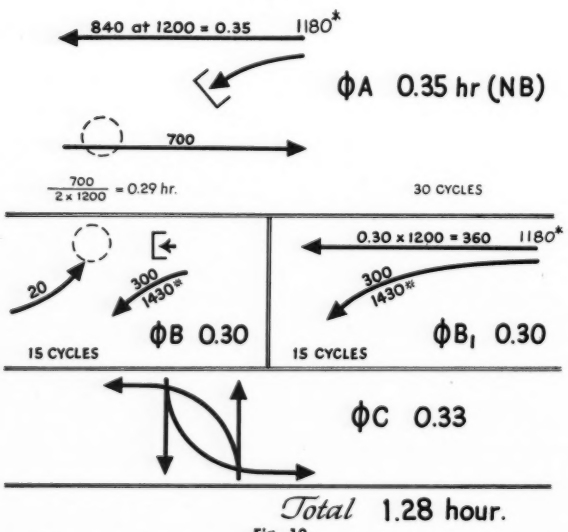


Fig. 10
Same 3-phase signal system as shown in Figure 9 with a split left-turn cycle.

Fig. 11
This signal is phased as indicated in Figure 10. Northbound left turns waiting while northbound through traffic (foreground) extend phase A. This has since been corrected by disconnecting detectors for northbound through traffic.

Phase C. At the "practical capacity" rates of 1,200 per lane-hour of through traffic and 1,000 per lane-hour of left-turning traffic, it will be seen that this totals up to 1.43 hours. This is the same as the previous two-phase diagram, and incidentally shows that when the left-turning volume is large nothing is gained by eliminating the third phase. On the other hand, a great deal is gained in the form of reduced accidents and peace of mind for the drivers of the left-turning vehicles.

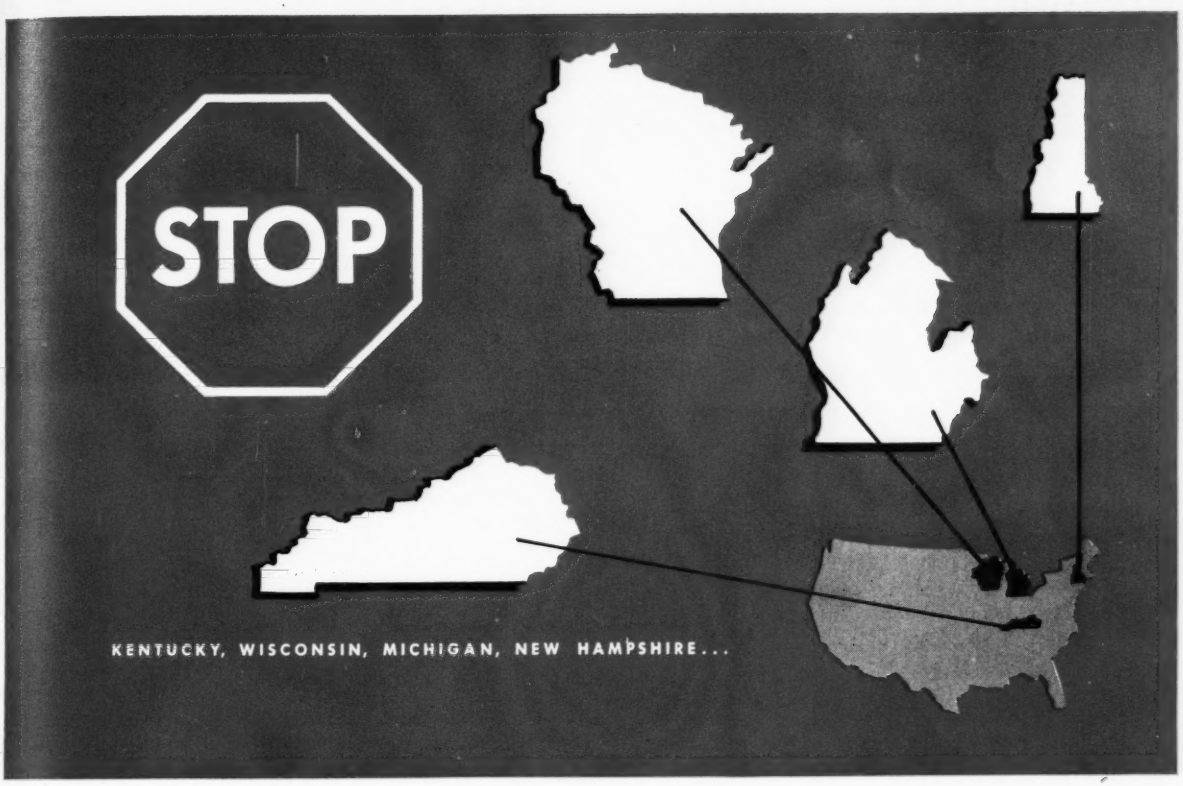
The 1.43 hour total shown here does not mean that traffic will be waiting 0.43 hour after the peak hour is over; it simply means that the flow will be at a rate of 43 percent higher than the assumed rates (1,200 for straight-ahead movements and 1,000 for left turns). This would have to be 1,725 per lane-hour on Phase A, which is a highly "impractical" rate (although possible) and would probably result in a backlog of more than a mile on the northbound approach. The asterisked figures in Figures 8, 9, 11 and 13 are the per-lane-hour-of-go-time rates at which traffic would have to clear to get all of the movements out in one hour.

Attention is invited to the idle space ahead of northbound through traffic during Phase B.

In order to utilize some of the idle space referred to in the previous paragraph, we split the left-turn phase so that during the cycles which have no call for the minor left turn the through movement can keep going (see Figure 10). It will be noted on this diagram that Phase A needs to last only 0.29 hour for southbound traffic and a large number of northbound cars can go during Phase B, while their partners are making the left turn. The required time with this scheme totals 1.28 hours, which is another way of saying that the lane-hour for the left-turn and for the minor through-movement will have to be 28 percent above practical capacity.

Although Figure 6 shows that theoretically only 0.35 of an hour will be used in Phase A, it doesn't really work that way. With a traffic-actuated signal, the green interval is extended by the moving traffic until a gap in that traffic comes along. For that reason Phase A, while it only has to be 0.35 hour, actually keeps extending out to the value required by all of the northbound traffic. In the meantime, the northbound "partners" in the left-turn lane are waiting (see Figure 11). During this extra extension of Phase A the area of conflict between northbound left turns and southbound through traffic is idle.

In order to be sure that this would not happen, the scheme shown in Figure 12 was thought up. In this scheme



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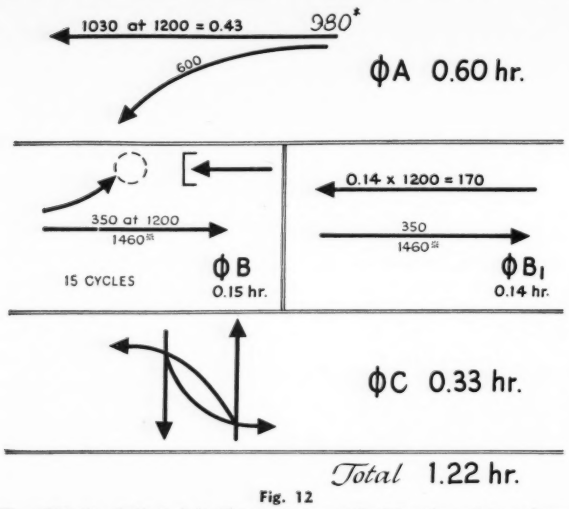


Fig. 12
The difficulty indicated in Figure 11 was solved by the scheme shown in this Figure. The outbound major movement and their partners moved together and the through movement does not get a chance to hold against the parallel left turn.

the outbound major movement and their partners go together, and the through movement does not get a chance to hold against the parallel left turn.

Note that the total time required at "practical" rates of 1,000 per lane-hour for left turns and 1,200 per lane-hour for southbound through, plus 0.33 hour for the side street, only adds up to 1.22 hour. In other words, if the northbound left-turn moves at a rate of 1.22 x 1000, or 1,220 per lane-hour and southbound moves at a rate of 1.22 x 1200, or 1,460 per lane-hour, the intersection will clear. Rates like these imply a small amount of backlogging; usually not more than three or four cycles per hour will fail to clear. There is a total of 0.74 hour and two lanes available for the 1,200 northbound through traffic; so the actual rate for that movement needs to be only $\frac{1200 \times 1.22}{2 \times 0.74} = 980$ per lane-hour. Compare this with 1,725 per lane-hour in Figure 9 and 1,180 per lane-hour in Figure 10 for the same movement.

During the evening peak, the scheme shown in Figure 12 allows idle time only during Ø B, and then only when there is a call from southbound left turns (shown by dashed

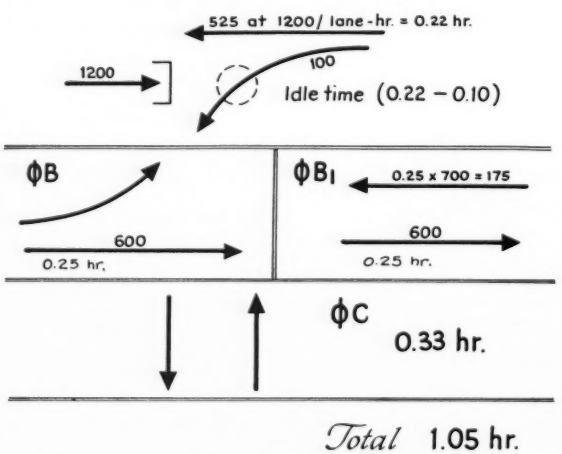


Fig. 13
Suggested 3-phase signal installation for morning peak.

circle). Because northbound through traffic has plenty of time, this is not critical from a capacity standpoint, although annoying from a delay standpoint.

However, in the morning peak and on Sunday afternoon, there is a lot of idle time in Phase A during which the major (southbound) movement is chomping at the bit while their northbound partners in the opposite direction are moving (as shown in Figure 12). On Sunday afternoons when everybody is going back to town and the major movement is even greater than the morning peak, this becomes very critical. It can only be corrected by disconnecting the northbound detector whenever the light is green for that movement. When we do disconnect the northbound detector we run the risk of going into Phase B too often (rather than Phase B_1). During the regular peak hours, as seen in Figures 12 and 13, northbound has enough partners, either northbound left turns or southbound through, to get them out. But it is possible, with well-spaced individual vehicles arriving in the southbound left-turn lane about once per cycle, that there will not be enough Phase B_1 during some off-peak conditions.

Therefore, the final solution was to provide a so-called

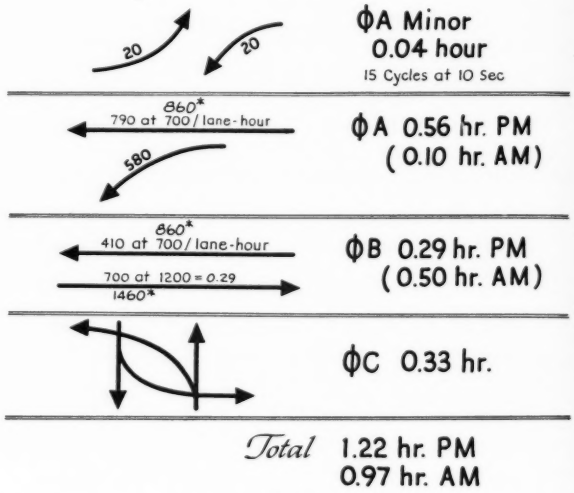
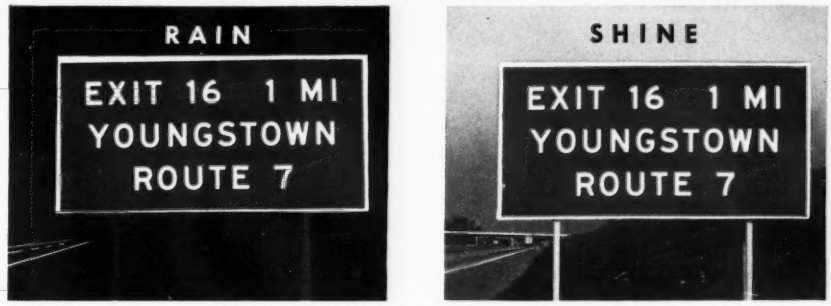


Fig. 14
Signal solution to this intersection was a 4-phase traffic installation as indicated in this Figure.

minor movement phase—in reality a fourth phase—which skips whenever there is no call in the southbound left-turn lane (see Figure 14). You will note that with this sequence, we still require 1.22 hours in the evening peak, which cannot be avoided as long as there is the 600 vs. 700 conflict of left turns and southbound traffic. But we have guaranteed that there will be no idle time day or night, nor on Sundays either. The required rate on the major leg in the P.M. peak has been reduced to 860 per lane-hour of green-yellow. Here is one case, at least, where additional phases are certain to reduce delay, notwithstanding the popular conception that every additional phase tends to increase delay.

It is not desired to leave that impression here that multiphase signals are a general cure-all. It is very true that at most intersections the minor movements may be so small that the minimum green per cycle will not be fully utilized, which is another way of saying that there is much idle time in the conflict area. The main point to remember is:

"Keep the area of conflict busy."



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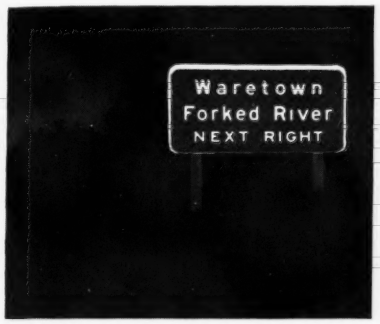
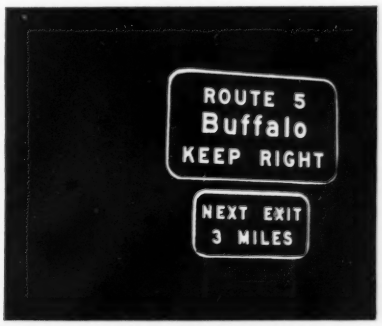


GARDEN STATE PARKWAY—NEW JERSEY

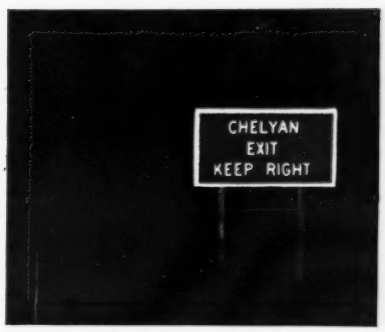
MAIN TURNPIKE



NEW YORK THRUWAY

TURNER TURNPIKE

WILBUR CROSS PARKWAY



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Use of Yield Signs

By Donald S. Berry (Mem., ITE)
Professor of Transportation Engineering
and
James H. Kell (Jr. Mem., ITE)
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University of California, Berkeley, California

The following article was originally presented at the Governor's Traffic Safety Conference held on October 7, 1955, in Sacramento, California. The authors of this paper invite comments from those who have had some experience with yield signs and these comments will be published in a future issue of the magazine.

YIELD-RIGHT-OF-WAY SIGNS were legalized in California, by approval of Assembly Bill No. 131, which was signed by Governor Goodwin Knight on June 3, 1955. The law became effective on September 7th. This law authorizes state and local authorities to erect Yield signs at one or more approaches to intersections of streets or highways which are not through highways. The law also specifies the general design and the message on the sign, and sets forth the duty of drivers in entering intersections controlled by Yield signs.

Adoption of this legislation has raised questions in the minds of many public officials in California. The Yield sign is a new type of traffic control, and there has not been sufficient experience as yet to permit setting definite standards or warrants for the use of such signs. The purpose of this paper is to summarize some of the information available on the use of these signs, and to suggest some warrants for their installation, which may serve until more definite standards can be determined.

Experience in Other States

The first Yield signs used in this country were installed in Tulsa, Oklahoma, early in 1951. Since then, Yield signs have been used at intersections in many cities, including Dallas, Oklahoma City, Tulsa, Winnipeg, New York, Portland, Fresno, and Berkeley. Experiences in several cities have been summarized by Paul Rice, City Traffic Engineer of Evansville, Indiana, in a paper presented two years ago at the National Safety Congress in Chicago. The following information was taken from Rice's paper:

1. *Dallas.* Installed at more than 75 intersections. Used to protect secondary thoroughfares and at isolated intersections. Have replaced many stop signs. Observance has been good.
2. *Oklahoma City.* Nine percent decrease in accidents at 28 locations which have had Yield signs one year or longer.
3. *Tulsa.* Driver speeds were studied at five typical locations where Yield signs have been installed. In all, 2235 vehicles were observed, with only 12.6 percent classified as entering too fast. Accident experience at 50 locations where the signs had been in place for over twelve months was reported as improved.
4. *Portland.* The accident record at nine intersections showed a reduction; at three intersections no change; and at two an increase; one accident in one case and two in another. Although the pattern was not perfect, the accident reduction generally varied inversely with the volume. Two intersections on a street carrying 7000 vehicles per day showed no decrease in accidents, while two intersections on a street carrying approximately 1000 vehicles per day showed a decrease from eight accidents to one following installation of the sign.

National Consideration

Committees of two national organizations have been considering warrants for Yield signs. A committee of the Institute of Traffic Engineers, in a 1954 report, stated as follows:

> "The warrants for installation of Yield signs shall be determined by the traffic engineers until the time when enough installations have been made and observations tabulated to give a clearer interpretation as to the exact volumes of traffic necessary to install the sign. The Yield sign shall be used to protect secondary thoroughfares, and at isolated intersections when some hazard exists where two residential streets intersect."

The Joint Committee on Uniform Traffic Control Devices, in the 1954 revision of its Manual, has this to say about use of the Yield sign:

> "Some states and cities have found that at certain intersections where safety and efficiency require the normal right-of-way rule to be modified in favor of one of the highways, but where the standard Stop regulation is unduly restrictive, a Yield-Right-of-Way sign is both effective and convenient. The effect of the sign is similar to that of a Stop sign, but vehicles controlled by it need not come to a full stop except when necessary to avoid interference with other traffic that is given the right of way.
>
> "The Yield sign is still to be regarded as experimental in this country, though as a Priority-Road-Ahead sign it has had extensive and apparently successful use in Europe. Until it has proved its acceptability here it should be used cautiously, and only where suitable legislation has been adopted to define its meaning and to authorize its use. It should not be regarded as a substitute for the Stop sign where a Stop sign is warranted."

Experience in California

Two cities in California have had previous experience with Yield signs. Yield signs were installed in the City of Fresno in November, 1953, and in Berkeley in July, 1954. Fresno's original signs were 30-inch equilateral triangles with black letters on a yellow reflectorized background. Observations after the installation indicated that these signs were

IT'S NEW!

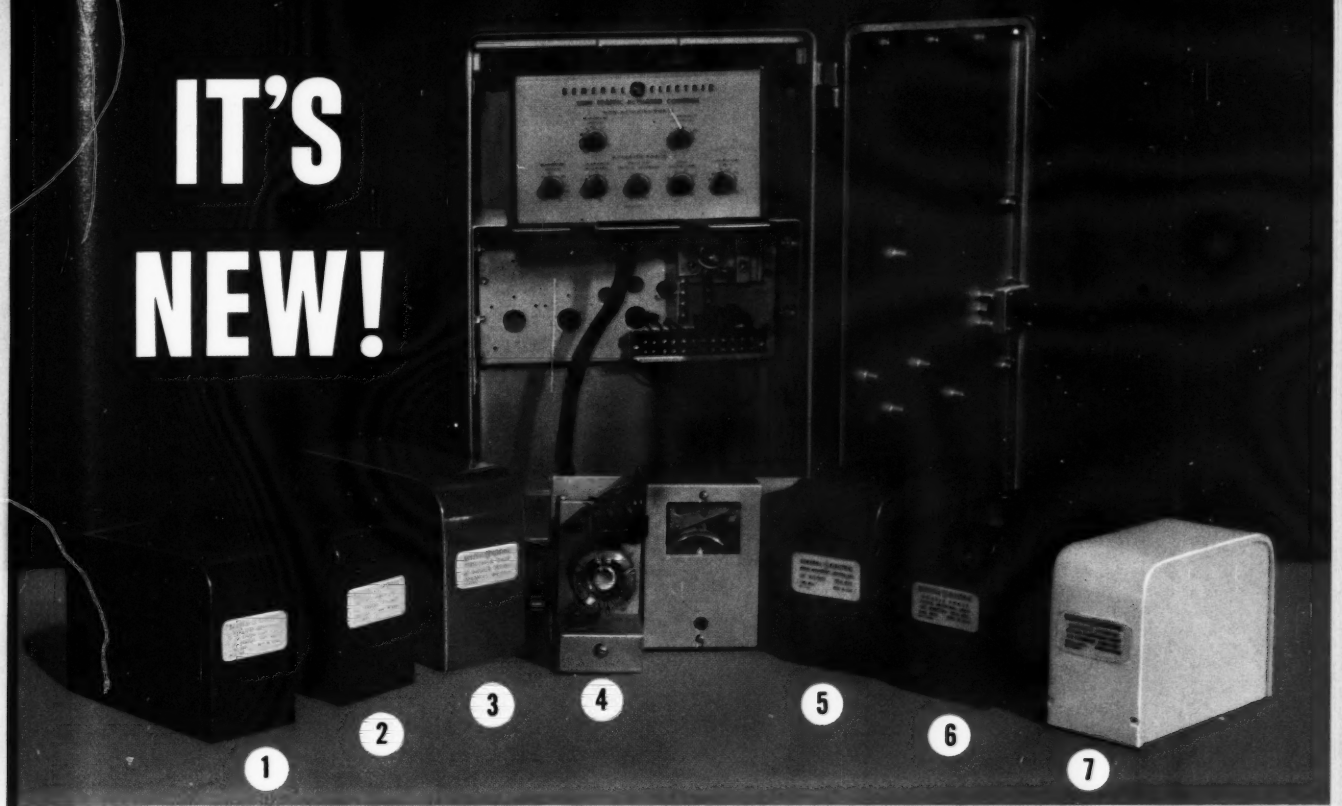

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TABLE I
Accident Experience Before and After Installation of Yield-Right-of-Way Signs* in Berkeley, California

Intersection Number	Before 7/15/53 to 7/15/54 PD**	PI**	Total	After 7/15/54 to 7/15/55 PD**	PI**	Total
1	1	1	2	3	0	3
2	4	1	5	2	1	3
3	3	2	5	2	0	2
4	1	0	1	0	0	0
5	5	1	6	3	0	3
6	5	1	6	1	0	1
7	1	0	1	2	0	2
8	14	1	15	4	1	5
9	4	1	5	2	0	2
10	4	1	5	0	0	0
11	2	1	3	2	0	2
12	4	0	4	5	0	5
13	6	0	6	2	0	2
14	4	0	4	1	0	1
15	4	1	5	2	0	2
16	1	1	2	8	1	9
17	1	1	2	2	0	2
Totals	64	13	77	41	3	44

*Signs installed on July 15, 1954.
**PD — Property damage collision.
PI — Personal injury collision.

too small. To increase the effectiveness of the sign, the word "Yield" was stenciled with beaded paint on the pavement in 8-foot letters approximately 100 feet in advance of each Yield sign. The signs were later replaced with 38-inch signs.

Yield signs were installed at 17 Berkeley intersections on July 15, 1954. The Berkeley installations also included marking the word "Yield" on the pavement approximately 100 feet in advance of the sign. A court case ensued, and on January 5, 1955, the courts ruled the signs illegal. Although the signs were erected before being legalized by state law, the accident experience before and after their installation has furnished some useful information.

A summary of the number of accidents in the year before and the year after the installation of the signs is presented in Table I. The total number of accidents at the 17 intersections was reduced from 77 to 44, a reduction of 43 percent. Personal-injury accidents were reduced from 13 to 3, a reduction of 77 percent. The number of accidents after installation was reduced at 12 intersections. At one intersection there was no change in the total number of accidents, but personal-injury accidents were cut to zero. At three intersections there was an increase of one property-damage accident per intersection. At one intersection, there was an alarming increase in accidents.

The Institute of Transportation and Traffic Engineering, in cooperation with the city officials of Berkeley, has studied each of the 17 locations where Yield signs were installed. These studies included before-and-after collision diagrams, condition diagrams, volume studies, and critical-speed determinations. These studies have not been completed for all intersections, but case studies of three intersections are presented below. These three case studies include one location where the number of accidents increased drastically after the installation of the Yield sign, and two locations where accidents were materially reduced.

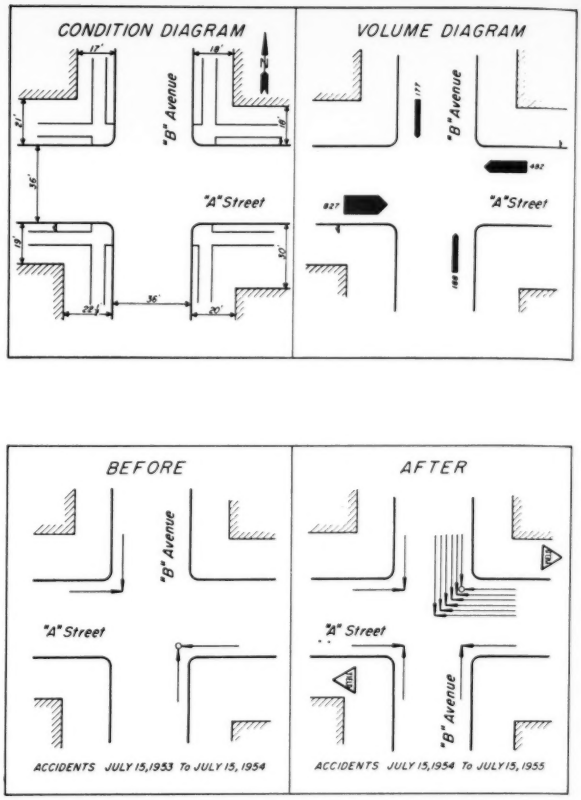


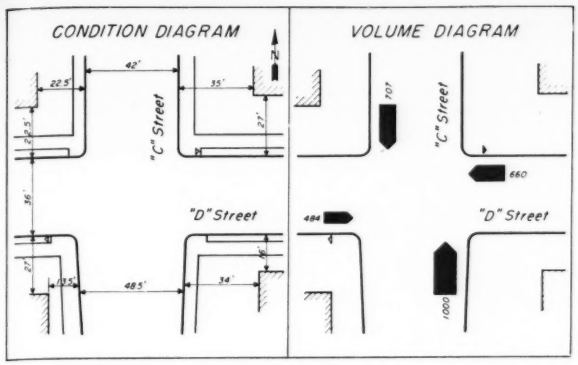
Fig. 1
Intersection Study of A and B Streets
Berkeley, California

The first case study is of the intersection of "A" Street* and "B" Avenue, located in a residential section of Berkeley. The upper portion of Figure 1 shows the condition diagram, the 24-hour traffic volumes at each approach, and the location of the Yield signs. It should be noted that the traffic volumes on "A" Street are considerably higher than on "B" Avenue, and yet the Yield signs were installed against the "A" street traffic.

The lower portion of Figure 1 shows the accident experience before and after the installation of the Yield signs at this location. There were two accidents (one personal injury) in the 12-month period before the installation of the sign, and nine accidents (one personal injury) after the installation. The safe approach speeds (a method for determining safe approach speed is presented in a later portion of this paper) for the traffic approaching the Yield signs are 16 mph for the westbound approach and 15 mph for the eastbound approach. These safe approach speeds are based on the ability of a vehicle to stop before colliding with vehicles approaching on the intersecting street at the speed limit of 25 mph.

It is quite apparent from the traffic-volume diagram that the Yield signs at this intersection were installed against the heavier volume. The resultant increase in accidents gives an indication of the consequences of attempting to require that vehicles in the major flow of traffic yield to vehicles approaching on a street carrying lower volumes. These Yield signs were shifted from the "A" Street approaches to the "B" Avenue approaches this past August. No accidents have occurred since the relocation of the signs. There were three

*Streets are lettered for convenience in discussion.



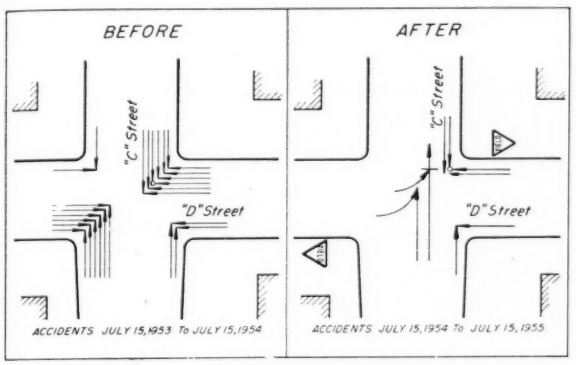
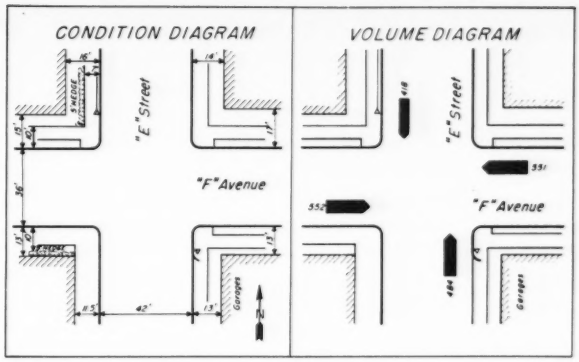


Fig. 2
Intersection Study of C and D Streets
Berkeley, California



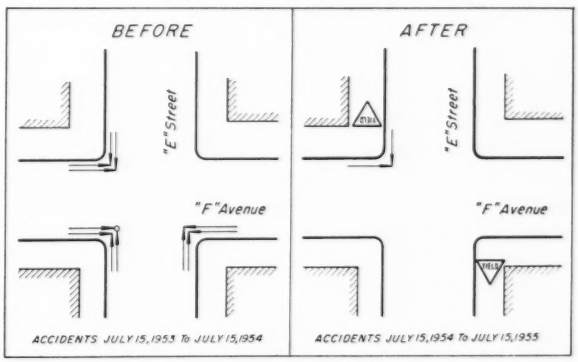


Fig. 3
Intersection Study of E and F Streets
Berkeley, California

other intersections where accidents increased after installation of Yield signs. In two of these locations, the Yield signs had been placed in the approaches carrying the heavier volumes.

The second Yield location studied is the intersection of "C" and "D" Streets. "C" Street is a residential street which at one time was a through street. It is parallel to, and one block away from a major north-south through street. "D" Street is parallel to a state highway. Local traffic uses this street during peak hours to avoid congestion on the state route.

The upper portion of Figure 2 shows the condition diagram and the traffic volumes for this intersection. The condition diagram shows that the view obstructions are set back farther from the curbs than in the previous case. The safe approach speed for westbound traffic on "D" Street was found to be 24 mph; the corresponding speed for the eastbound traffic was 19 mph. The traffic volume diagram indicates that the Yield signs have been placed in two approaches with the lowest volumes. The lower portion of Figure 2 shows that accidents were reduced from 15 to 5, a reduction of 67 percent. Two of the accidents during the "after" period involved turning movements. It should be noted that the accidents in the "before" period were concentrated on the northeast and southwest corners of this intersection. The safe approach speeds for vehicles entering on "D" Street for these two corners are 24 and 19.5 mph respectively. If this experience is typical, it appears that Yield signs can be helpful at intersections in residential areas where the view across the corners is relatively open.

The third case study is the intersection of "E" Street and "F" Avenue. As shown in the upper portion of Figure 3, this is a relatively blind intersection with buildings extending close to the property lines. Hedges help to obstruct the view. "F" Avenue carries the heavier volumes. The safe approach speeds on "E" Street are 10 mph for northbound traffic and 11 mph for southbound traffic. The before-and-after accident experience, as shown in the lower portion of Figure 9, shows a decrease in accidents from 6 to 1, an 83 percent reduction. In the six-month period prior to the year of "before" experience, there were four other accidents reported at this location.

These three case studies indicate that Yield signs can be a useful tool to control traffic at intersctions in residenial areas. The first case history shows the need for careful study before installing such signs, and the hazards that may result when these signs are placed against the major flow of traffic. The second case history indicates that accidents may be reduced through the installation of yield signs at intersections where sight distances across the corners may not be unduly restricted. The third case history shows that Yield signs can be effective at relatively blind intersections. These are just indications, however, and many more installations should be studied before making more definite conclusions.

These case studies, along with experiences in other parts of the nation, indicate that the Yield signs can be effective in reducing accidents when properly located and warranted. We must realize, however, the Yield sign is a new type of control and its misuse could lead to non-observance by drivers. Therefore, it is essential that Yield signs not be installed indiscriminately, but as the result of careful study of the individual location and the conditions that exist at that location.

Usage of Yield Signs

One of the purposes of this paper is to suggest some tentative standards or warrants governing the use of Yield signs. Before setting forth suggested warrants, however, let's consider what we want this sign to accomplish.

After some thought, it becomes clear that Yield signs should not be used in place of Stop signs at locations where Stop signs are needed for safety. The primary purpose of using Yield signs is to assign right-of-way without requiring a driver always to come to a full stop, as at a Stop sign. Therefore, the use of this sign may be proper at locations where the normal right-of-way rule creates potential hazards, but where a full stop is not usually necessary for safety. The Yield sign at such locations may tend to reduce accident frequency and also promote better driver observance of warranted Stop signs.

Now that we have defined the purpose of Yield signs, where should they be placed? The new law prohibits the installation of Yield signs at the intersection of a through highway. If none of the intersecting streets at a proposed location are through streets, the investigation may proceed. As a first step, we should consider the locations of the view obstructions on the corners. The Traffic Engineering Handbook (1950 Edition) suggests that Stop signs should be used at isolated intersections only when the view across the corner is so obstructed that the critical or safe approach speed on the minor street is 8 mph or less. This is based on the assumption that when a driver has to slow to 8 mph or less because of the view obstruction, he doesn't feel unduly restricted if he is required to come to a complete stop. If we apply this same principle to the Yield sign, we can thus specify that Yield signs shall be used only when the safe approach speed on the minor street is *greater* than 8 mph. This could form a logical basis for determining whether to use a Stop or a Yield sign at an isloated intersection which needs some control.

A diagram to facilitate the determination of safe approach speeds has been prepared. The first step in the procedure is to examine the location and obtain the exact placement of the obstructions to view, the street widths, and the approach speeds on the street with the heavier traffic volume. Then it is a simple matter to determine graphically the safe approach speed, by following the instructions given on the Safe Approach Speed Chart. This chart is based on the method first published by the American Automobile Association about 20 years ago.

The next step for determining whether Yield signs are needed might be a determination of the actual or potential hazard at the location. This may be revealed by accident experience or by complaints. Perhaps Yield signs should not be used unless there is a demonstrated hazardous condition, such as a record of at least two right-angle collisions in 12 months.

A third step could deal with the problem of selecting the approaches in which to place the Yield signs. The Berkeley experience demonstrates the need for placing the Yield signs in the approaches with the minor volumes. Until further data is available, it is suggested that Yield signs be placed only on two opposing approaches to a four-way intersection. There are possibilities of placing Yield signs on three approaches to a five-way intersection, but careful study should be made of such locations. No consideration should be given at the present time to three-way or

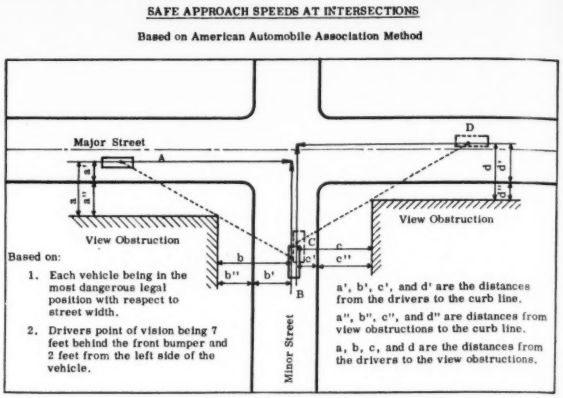

SAFE APPROACH SPEEDS AT INTERSECTIONS
Based on American Automobile Association Method
Major Street
Minor Street
View Obstruction
View Obstruction
Based on:
1. Each vehicle being in the most dangerous legal position with respect to street width.
2. Drivers point of vision being 7 feet behind the front bumper and 2 feet from the left side of the vehicle.
a', b', c', and d' are the distances from the drivers to the curb line.
a'', b'', c'', and d'' are distances from view obstructions to the curb line.
a, b, c, and d are the distances from the drivers to the view obstructions.

Fig. 4
Safe Approach Speeds at Intersections.

four-way Yield-sign installations at four-way intersections. Such installations would confuse the drivers and probably would lead to non-observance of the signs.

The use of Yield signs at several intersections along the same street is a possibility for consideration. Such usage will in effect create a secondary thoroughfare which, by encouraging higher continuous speeds in the thoroughfare, may create a hazardous situation. It is suggested that this use of Yield signs be avoided, at least until experience is obtained on such installations. The California state law implies a prohibition of this type of usage by prohibiting use of Yield signs at through highways.

Tentative Warrants

The principles stated above can be summarized in a statement of tentative warrants. These apply primarily to streets which are in residential areas and which are not through streets. All of these warrants should be satisfied before the Yield signs would be installed:

1. The safe approach speeds on the street having the minor volume are greater than 8 miles per hour and are less than the normal speed of traffic between intersections.
2. There is a demonstrated hazardous condition existing at the intersection such as an accident record of at least two right-angle collisions in a 12-month period.
3. The traffic volumes on the street or approaches to be signed are less than the volumes on the street carrying the major flow of traffic through the intersection.

Use of Yield signs in rural areas has not been studied, so it is not possible at this time to offer suggested warrants for installation in such areas. Perhaps the warrants offered for residential areas may apply for rural conditions also.

Suggestions in Using Yield Signs

When starting to use Yield signs, it is suggested that the following procedures be followed:

1. In selecting locations for the first installations, make careful studies of physical and traffic conditions, and utilize the tentative warrants given on the preceding page.
2. Use signs of the standard design and placement, as specified in the next section.
3. Inform motorists of the meaning of the signs, as described later.
4. Evaluate results with before-and-after studies similar to the case histories described here.

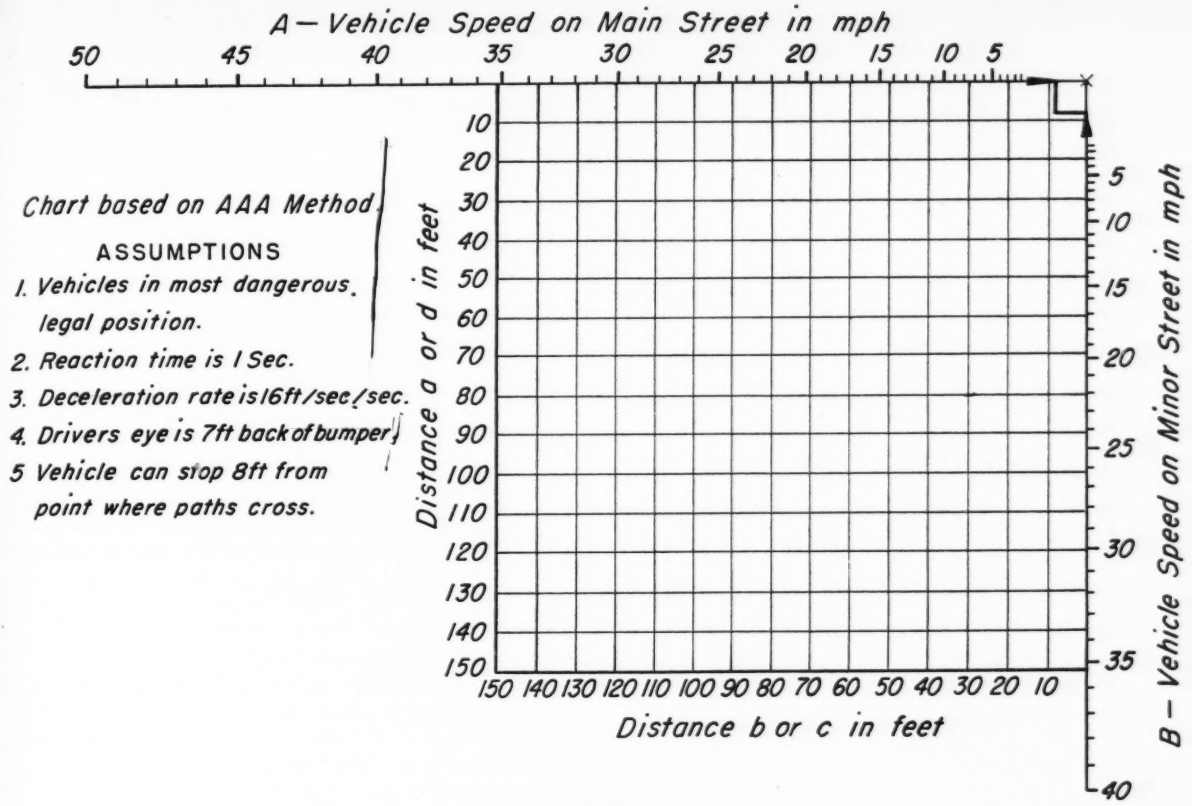

A — Vehicle Speed on Main Street in mph
50 45 40 35 30 25 20 15 10 5
Chart based on AAA Method
ASSUMPTIONS
1. Vehicles in most dangerous legal position.
2. Reaction time is 1 Sec.
3. Deceleration rate is 16ft/sec/sec.
4. Drivers eye is 7ft back of bumper.
5 Vehicle can stop 8ft from point where paths cross.
Distance a or d in feet
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
Distance b or c in feet
B — Vehicle Speed on Minor Street in mph
5 10 15 20 25 30 35 40

Fig. 5
Safe Approach Speed Chart

INSTRUCTIONS

1. Determine the values of a', b', c', and d'. For most dangerous legal position, the values for a' and c' are either 12 feet (with parking) or 6 feet (without parking); values for b' and d' are either one half the street width plus 3 feet, or the street width minus 12 feet, whichever is smaller.
and d").
2. Measure distances from view obstructions to curb lines (a", b", c", and d").
3. Determine the critical distances a, b, c, and d (a = a' + a", b = b' + b", c = c' + c", d = d' + d").
4. Locate the view obstructions on the chart (on reverse side of sheet), by using the values of (a, b) and (c, d) obtained above.
5. Determine the speed value for the major street by measuring the approach speeds and determining the 85th percentile value or by using the value of the speed limit.
6. Draw straight lines through the speed value in mph for the major street (on the "A" scale) and the points of the view obstructions as located in item 4 above.
7. The intersections of these lines with the "B" scale are the safe approach speeds on the minor street relative to the two view obstructions.
8. The slower of these two approach speeds is the critical speed and is the maximum safe approach speed of a vehicle entering from the minor street.
9. This procedure is duplicated for the opposite approach of the minor street.

Design and Location of Yield Signs

The state law requires that the Yield sign conform to the standard specified in the National Manual on Uniform Traffic Control Devices. The California State Sign Committee has recently adopted a design which is a 40" equilateral triangle with corners cut to a 4-⅜" radius, and with the word "Yield" in 8-inch letters. The sign is yellow with black letters, and must be reflectorized or illuminated. Pavement markings, including a limit line and the word "Yield", may also be used. If the Yield markings are used, it is suggested that the letters be at least 6 feet high and placed approximately 100 feet in advance of the sign. The Yield sign should be placed in the same physical location as would be used for the Stop sign.

Informing motorists. Since the Yield sign is a new type of traffic control device, motorists need to be informed about the meaning of the sign and their responsibilities when approaching an intersection which has Yield signs. Therefore, when Yield signs are to be used, especially for the first time, a well-planned and extensive program of public education should be carried out, utilizing the press, radio, television, talks, and other media of public information.

Evaluating results. After Yield signs have been erected, studies of motorist compliance and accident experience should be made to aid in revising warrants at a later date. The Institute of Transportation and Traffic Engineering is planning to continue research in this field, and would appreciate your assistance in keeping the Institute informed about results obtained with installations of Yield signs which are made in your jurisdiction. Any additional case histories similar to those presented here today will add to the store of knowledge available.

Although the Yield sign offers great potentialities for control of traffic at intersections, let's approach the use of Yield signs cautiously, and collect the factual information which is needed for their proper evaluation. Only in this way can we develop sound standards for proper use of Yield signs.

How to Organize and Write Effective Technical Reports

By Ralph A. Richardson
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and
C. A. Brown
General Motors Institute

This article first appeared in the 1955 September-October issue of the General Motors Engineering Journal. In the writers' own words, "Engineers too often think their part of the job is finished when they complete their tests, drawings, or designs. However hours spent in writing may well prove to be an engineer's most productive time."

THE VERY NATURE of the engineering profession dictates that those who practice it must be able to report their findings in a clear, concise, and accurate manner in order to insure the best utilization of the data being reported and to contribute significantly to the ever-expanding store of technical knowledge. There is a great deal of evidence that engineers do write and, as a matter of fact, with a considerable degree of proficiency. This is evidenced by the ever-increasing size of *The Engineering Index* and the many fine articles which appear in engineering periodicals. Moreover, the quality of the writings in the technical literature during the past 10 or 15 years has steadily improved. The engineering colleges and universities are to be commended for the outstanding work they have done over the past decade to effect this improvement.

Engineers too often think their part of the job is finished when they complete their tests, drawings, or designs. The part of the work that makes the job useful or successful is frequently an analysis of the results presented in a well-prepared report. One of the very important jobs of the engineer is therefore, to produce technical writings that will be read, understood, and used by all groups, even though they are probably not familiar with the subject. This means that there must be a large element of sales and educational effort in any technical writing. Hours spent in writing may well prove to be an engineer's most productive time. Moreover, from a selfish standpoint, the engineer or scientist who can do an effective job of communicating his ideas to others—particularly to those in management—usually advances up the professional ladder somewhat faster than his colleagues who have not acquired this ability.

What constitutes a good technical report? The following general comments may help to answer that question:

- The text should be neither ambiguous nor subject to misinterpretation by any reader, regardless of his technical background.
- The report should reflect sound, objective thinking.
- The content should be factual and easily read. Word choice should lean toward simple rather than complex words.
- A report demands and is strengthened by the use of the correct word. Knowledge of the language and its principles of usage will aid in the expression of the writer's thoughts.
- The neat and orderly report commands respect.

Kinds of Technical Reports

Generally speaking, technical report writing falls into four categories: (a) letters, (b) memorandum reports, (c) progress report or final report.

Letters

It may seem strange that letters are considered a form of technical reporting. Often, however, they include important data or facts, and it is not uncommon to see a project engineer thumbing through his correspondence file for letters written to associates concerning a particular project or investigation which may help him in the preparation of a progress report or final report.

Memorandum Reports

The memorandum report is usually written on a standard form for limited distribution within the organization. It is purposely kept as short and to the point as is practical to get pertinent information about a particular project on paper as quickly as possible and distributed to people in the organization who can use it effectively in connection with their own work.

Progress Reports

The progress report generally is much longer and more formal in its style and format than the memorandum. Usually, a progress report is made when work on a project has reached the end of a particular phase or at regular intervals set by management. For example, a long-range project of possibly two or three years' duration should produce a progress report at the end of the preliminary investigation or literature-searching phase. At this point it would be decided whether or not to continue the project on the strength of the information uncovered. Progress reports many times are prepared to recommend steps in future planning or in some cases to indicate results that may be forthcoming. Such reports also keep top management informed regularly of the activities going on in the engineering department.

Final Reports

The final report, as its name implies, is the last to be written concerning a particular project or investigation. It is often quite long and covers in minute detail all the salient facts about the project. A great deal of care must be exercised in writing the final report as it becomes a permanent record, and the conclusions, recommendations, and data it contains may be used for many years as a reference for making deci-

sions and in gathering material on new investigations. The final report should, therefore, be as complete as it is possible to make it.

Almost all organizations that employ engineers and other technical people use a form of report similar to one of these. Experience has shown that the engineer who performed the experiments should be responsible for writing the report, since he is the only one who knows all of the details.

Organizing the Technical Report

There are many ways of organizing and writing a technical report. The method used will depend upon the use to which the report will be put and the kind of subject matter it contains. In other words, the kinds of readers and what they need to get from the report will govern the organization and language. In addition, there are sometimes "ground rules" of the organization that must be observed.

No matter who the readers are they will want to know early in the report what it is about, the extent of the coverage, and the most significant information contained in the report. For this reason, reports that are predominantly informational are oftentimes preceded by a summary or abstract to provide the user with a quick understanding of the content. Incidentally, the validity of such a report rests upon its completeness, accuracy, and ease of use. On the other hand, a report that gives the outcome of a study, an investigation, or research must provide a clear statement of the problem, an explanation of the method employed in solving the problem, and a clear statement of the results of conclusions.

One method of organization that is used in reporting a piece of research or information has evolved through years of experience and has proved to be a highly effective way of presenting technical material. The general organization of the material is as follows:

- Title
- Table of contents
- Opening
- Conclusions
- Recommendations
- Body of the report
- Reference list.

Although this sequence differs somewhat from the common practice of technical report writing in many organizations, it is recommended primarily because it is easier for the reader to grasp the problem and conclusions of the investigation without having to read through the entire manuscript, and leaves him free to peruse the details at his leisure. One of the first steps in an engineering investigation is to make a search of the literature in the field of the investigation to find out what others have done on the same or similar problems. It might be mentioned here that all engineers should be familiar with library services and how to use them efficiently. The next step is to select a suitable title for the work.

Title

The title should indicate the contents of the report to the prospective readers by being as descriptive as possible. Some authorities oppose this view, maintaining that very often the title becomes too long and involved; but it would seem that for technical reports, at least, the advantages of a descriptive title outweigh the disadvantages. Recent practice in many organizations is to give the report a short title composed of key words followed by a longer, more descriptive subtitle.

Table of Contents

A table of contents is included in most engineering reports to help the reader locate quickly and easily the main sections and subsections of the report and to give an idea of overall content. Usually, however, in the case of relatively short reports the contents page is omitted.

The table of contents is usually prepared from the author's outline used in writing the report, since it lists in detail all of the important points covered in the text. It might be well at this point to mention that a well constructed outline is essential to good report writing. While it may seem that the preparation of an outline is a non-productive effort, experience has shown it insures that all points are discussed, that the chances of leaving something out are minimized, and that the writing is kept on target. Generally speaking, it is not necessary to outline the opening, conclusions, and recommendations unless these sections are long and complex. As a general rule, however, it is better practice to keep them as short as possible.

Opening

The opening of an engineering report in some cases is called a foreword and in others the introduction. In either case, however, the opening should be a clear-cut statement of the problem or investigation undertaken and should be given careful thought. Many engineers make an entry in their logbook on the day the project is assigned, stating briefly what they are setting out to accomplish. Very often this log entry serves as the opening to their report. There is considerable merit in doing this because engineers, like other people, are human and sometimes have a tendency over a period of time to lose sight of the specific objectives of a particular project. Reference to the logbook and to the brief statement of the problem as expressed on the day it was assigned helps not only to keep the objective in mind, but also proves helpful when starting to write the report.

Conclusions

The conclusions should follow directly after the opening of the report and, in general, should point out what the engineer found out about the problem stated in the opening. Although the conclusions are sometimes listed numerically, they need not be; however, each should be separate and distinct from the other so as not to confuse the reader about the points being emphasized. Each conclusion should be a specific, positive statement and should leave no doubt as to its true meaning.

Recommendations

An author's recommendations very often can be the most important part of a technical report, and their adoption or rejection depends to a large extent on the manner in which they are presented. Like the conclusions, they should be positive statements suggesting some specific thing to be done or course to be followed, and should include an estimate of the cost involved, if any. Few engineers like to be concerned with how much it costs to do things, but it is almost a sure bet that the first question asked after reading the recommendations in a report will be, "How much will this cost?" It is good report writing technique to anticipate this question by giving solid figures based on the best estimates that

can be made. If this is done, the chances of the recommendations being accepted will be greatly enhanced. Moreover, this technique of anticipating questions should be considered not only with regard to costs, but with regard to every phase of the report. It is a practice that is highly recommended.

These three parts, the opening, conclusions, and recommendations are the most difficult for the majority of technical men to write satisfactorily because they must summarize the work in simple language. They are written for the person who does not have enough time to familiarize himself with the many details of the subject—particularly for the executive who must make engineering decisions.

Discussion

The body or discussion of an engineering report is generally the largest single section. In it are included details of the investigation such as:

- Text which supports all conclusions and recommendations
- The kind and accuracy of the instrumentation used
- Test setup and problems encountered in this phase of the work
- Detailed explanation of the test procedure
- Presentation of data taken along with an interpretation and analysis of these data.

Illustrations such as curves, photographs, charts, and tables should be included to enrich the discussion. (Details as to handling illustrative material are discussed under the heading *Illustrations* in this paper.)

Usually, the biggest problem in connection with the body or discussion section of the engineering report has to do with organization of the material being presented. Care should be taken to arrange the material in a logical manner so that a reader unfamiliar with the subject can readily grasp the meaning of what has been written. Thus, the first subheading in a typical report might be *Historical* or *Background Information.* A few opening reports outlining the project and pointing out some of the thinking leading up to the work are very helpful in orientating the reader to the problems and objectives of the investigation. Following this, the information gathered should be presented as simply and as straightforwardly as possible, avoiding trite expressions and techniques which lower the literary and informational quality of the report.

While this paper is primarily concerned with the organization of material and the mechanics of technical report writing, it should be emphasized that the application of the rules of good grammar and composition is a prerequisite to quality report writing. This does not mean that every engineer is expected to be an expert writer, but does assume that he is well grounded in grammar, spelling, and the rules of good composition.

A generous use of subtitles throughout the discussion helps the reader to visualize more completely the overall picture or scope of the work, as well as to gain a more lasting impression of the material presented. Moreover, subtitles tend to break up long expanses of straight text which very often are dull and difficult to read. Subtitles also tend to dramatize the material and improve greatly the overall quality and readability of a technical report.

Reference List

The reference list is an important part of the technical report and much care should be given to its preparation. This should consist of two lists: (a) the periodical list and (b) the book list. References are best listed alphabetically by author, each entry to include the title of the article or book, the volume and number in the case of periodicals, the publisher in the case of books, the date of publication, and finally page references. Only those works which the author has read and feels are pertinent to the subject of the report should be included in the reference list. Numerous titles of books and periodicals listed merely to impress the reader or to add bulk to the manuscript most often accomplish the opposite effect.

Illustrations

Illustrations are included in an engineering report to enrich the text as well as to make it easier to understand. Like the reference list, illustrative material should not be used just for the sake of having it or to increase the bulk of the report. Nor should it be used as a crutch for poorly written material. Rather, illustrations should be looked upon as aids in explaining points covered in the text. Good illustrations not only enhance the appearance of a report, but they also aid greatly in making more lasting impressions upon the reader than do words alone.

Illustrations include such things as photographs, drawings, curves, sketches, and tables of data. Very often the discussion section of a technical report is devoted almost entirely to the interpretation of illustrative material. Many authors, however, experience difficulty in deciding what and how many illustrations to use. A general rule to follow in this connection is to use illustrations only when they are necessary to support the thoughts, ideas, or points in the report. Many engineering reports are inadequate because of a lack of good quality illustrative material.

Illustrations should be large enough to convey the message clearly and quickly. Too often, size is sacrificed for economy reasons. Authors sometimes select small photographs or print too many illustrations on a page. Pictures should be reproduced large enough so that all pertinent details are readily apparent. Sometimes, photographs are retouched to highlight or accent a particular area which helps to clarify points discussed in the text. Curves which graphically illustrate engineering data should be plotted neatly and reproduced page size, if possible, particularly if the author has prepared them with the idea they will be used for "picking off" values. Sketches and drawings, like photographs, always should be large enough to show clearly all necessary details

Summary

Success in engineering, as in all other organized undertakings, depends as much on the ability to present an idea convincingly as it does upon the ability to perform experiments and calculations. The most miraculous discovery in the laboratory is not a contribution to the store of knowledge until the results are recorded and transmitted to others. A written report is often the only record which is made of the results that have come out of years of thought and effort. It is used to judge the value of the engineer's work and serves as the foundation for all future action on the project. If the report is written clearly and precisely, it is accepted as the result of sound reasoning and careful observation. If the report is poorly written, the results presented in it are often dismissed as the work of a careless or incompetent worker. Most engineers can become good writers if they will put the same thought and effort into this phase of their work as they do in conducting their experiments.

Planning for Shopping

By Victor Gruen (Mem., American Institute of Architects)
Victor Gruen Associated Architects and Engineers, Detroit, Los Angeles and New York

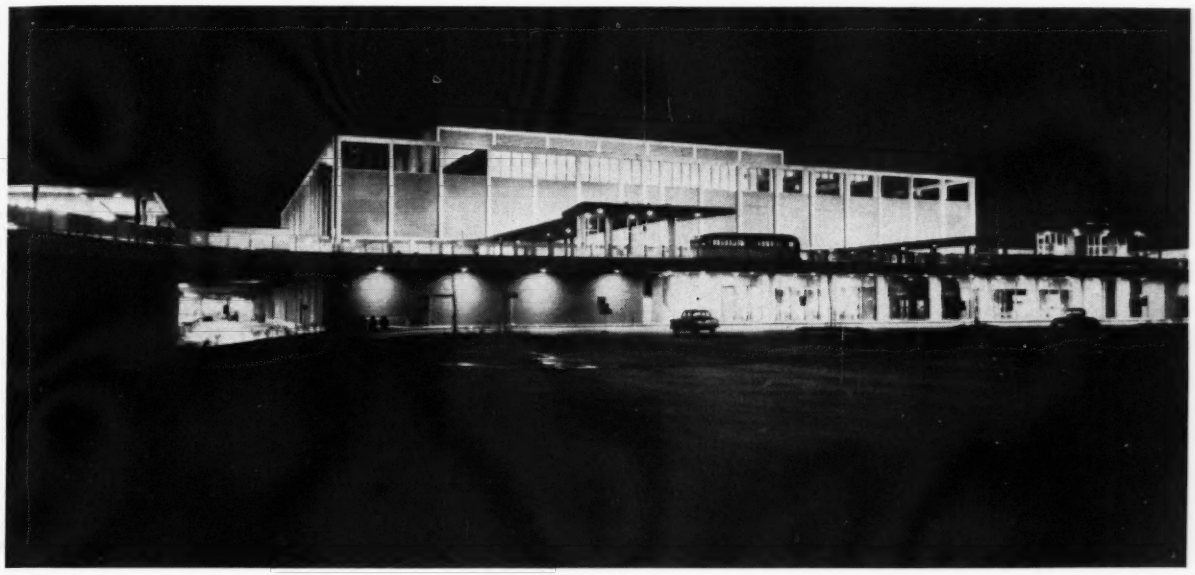

Fig. 1
All types of traffic are planned for at Northland Center. In the foreground is a parking area for private automobiles, while the elevated roadway is designed for mass transit. At the lower left is a tunnel entrance for truck traffic.

The problems of revitalizing the downtown area is not new. However, Mr. Gruen, because of his extensive experience both in downtown redevelopment and in the development of suburban shopping centers, is in an unique position to compare the downtown and suburban shopping areas and recommend steps to be taken for adequate planning. Many readers will recall Mr. Gruen's distinguished article "Traffic Impact of the Regional Shopping Center" which appeared in the March 1953 issue of TRAFFIC ENGINEERING. *The following paper was presented at the recent Boston Conference on Distribution.*

I HAVE ENTITLED my talk PLANNING FOR SHOPPING, choosing the words PLANNING and SHOPPING carefully for their special meaning in connection with the matters I would like to discuss.

I am using the word PLANNING in order to imply a procedure which goes beyond store design, merchandising layout or the design of fixtures and store fronts.

I define PLANNING as the creation and implementation of concepts designed to create optimum conditions for certain human activities over an extended period of time.

I am talking about PLANNING FOR *SHOPPING*, rather than about planning for *selling* because I believe that, by focusing our attention on creating desirable conditions for the buyer or shopper, we will most effectively and consistently serve the best interests of the seller.

PLANNING FOR SHOPPING, then, means developing ideas which, encompassing a wide area of factors, will serve to make shopping an easier, more pleasurable and, therefore, more desirable activity.

PLANNING FOR SHOPPING is, of course, nothing new. It has been done in the past by many individual merchants within the confines of their own four walls. From it have resulted innovations such as social meeting places in department stores (restaurants and auditoriums), air conditioning, the supplying of baby strollers and shopping bags, carefully-selected color schemes and lighting arrangements—all with the aim of bringing about a pleasant shopping atmosphere.

However, planning within the confines of an individual structure, even if it is a large one, has its limitations. As our cities grew, as mechanization spread over wider and wider areas, as the automobile became the means of mass transportation and the complexities of our lives became overpowering, the interdependence of individual attainment with the public interest became increasingly clear.

Even the most brilliant merchant, with all the best PLANNING FOR SHOPPING within his own store, will not be able to thrive in a downtown area which suffers from poor traffic and parking conditions.

Replanning of our cities has been urged by city planners and architects for years. Many books have been written—many theories and schemes have been expounded.

But unfortunately, there is a strange reaction to the word PLANNING from the men in the business world. They seem to feel that planning would somehow interfere with the free expression of individual initiative, of free enterprise. This attitude, in my opinion, is based upon a regrettable misunderstanding. Many a businessman seems to live under the impression that suddenly, now, in mid-century, "highbrows" and "longhairs" are asking that cities be planned after they had been allowed for such a long time to grow freely, happily and without interference, like flowers in the field.

Few people seem to realize that all of our American cities are the products of planning; they all have been con-

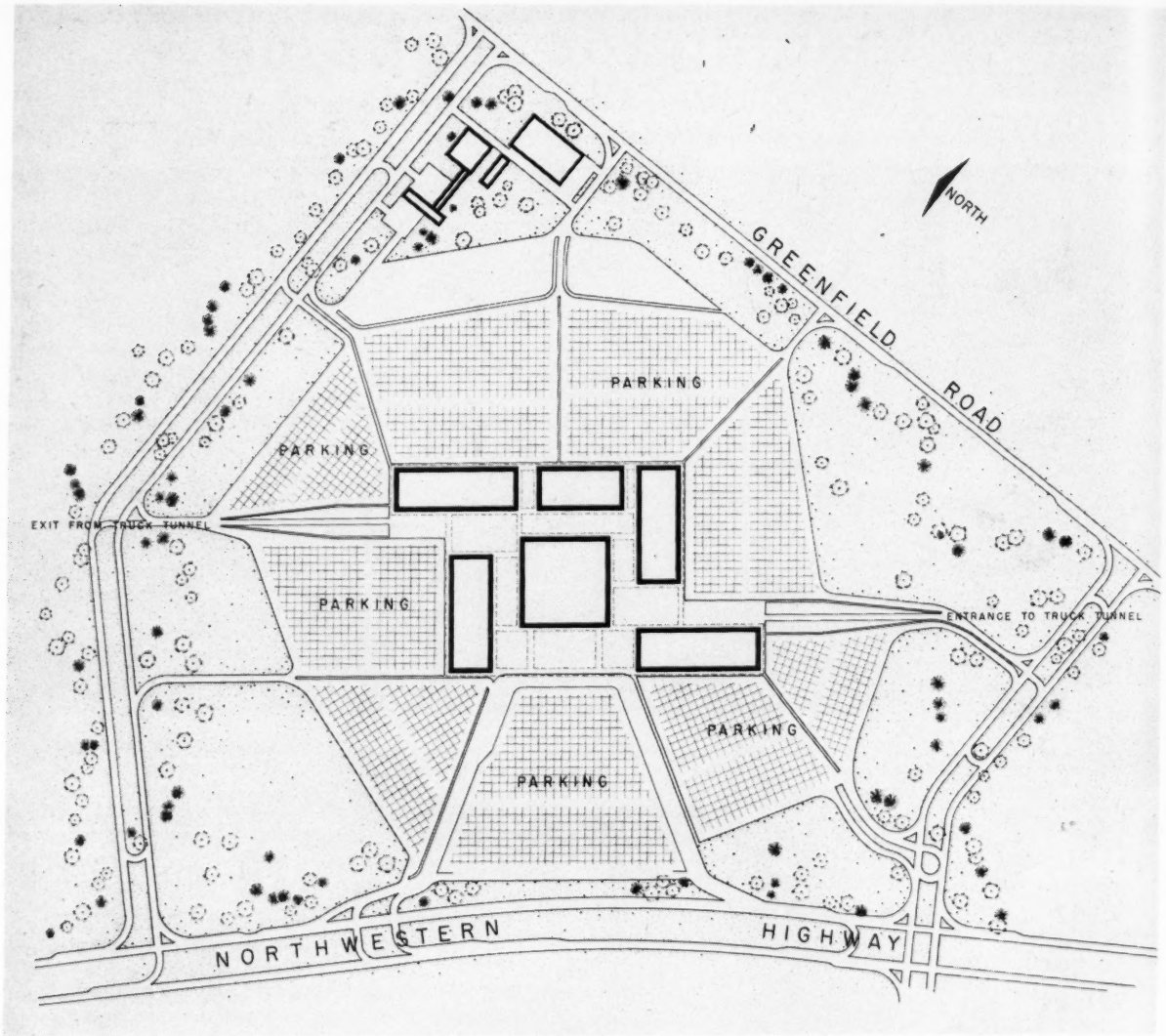

Fig. 2
General plan of Northland Center. Note the entrance and exit of the truck tunnel and the divided highway on the west perimeter of the center.

ceived on the drafting board. In fact, the nation itself was land-planned into a giant grid-iron pattern between 1785 and 1862.

All of these plans have a few things in common: they impose a very strict discipline, mostly a grid-iron pattern, on our cities and they all were devised and implemented before decisive changes in our economic life took place. All of these plans were drawn before we had the slightest inkling of the meaning of the terms, "mass production," "mass distribution," and "'mass mechanical transportation."

Thus, we planners are not suddenly proposing to force an organically grown human environment into the straitjacket of planning; we are only suggesting that it is imperative to bring old, out-moded plans up to date.

There are many danger signals which make it amply clear that this replanning process cannot be postponed much longer. Look at the plight of the average central business district, where merchants must operate on land with high evaluation, must offer a wide selection of merchandise at competitive prices, but must bring their customers through a series of obstacles which become increasingly discouraging with each day; heavy traffic, insufficient parking space, noise and fumes. Total the wasted manhours, the wasted gallons of fuel, the depletion of nervous energy, the policing costs and the repair bills involved daily on overcrowded streets, and then contrast this situation with that of suburban shopping areas built on land of 1/50th the cost, offering amenities to the shopper and lower rent to the merchant. Is it any wonder that many of the very same merchants who made downtown a powerful retail center are joining the march to the suburbs?

No city, no central district can afford this situation.

The awareness that something was foul in the state of the downtown areas has come with increasing force during the last twenty years. A wild flight to the suburbs, under the banner of decentralization at any price, has started. Stores began to settle in long rows along both sides of arterial highways, transplanting many of the evils from which they had

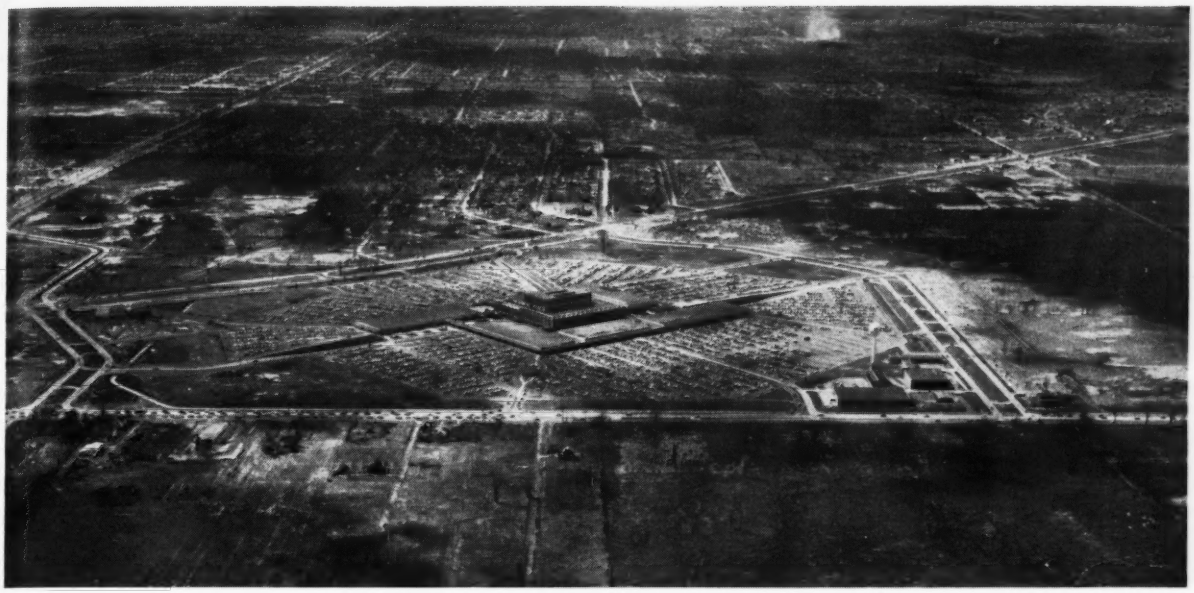

Fig. 3
This aerial view of Northland indicates the traffic generating power of a suburban shopping center.

fled into their new locations. They acted like picnickers who, having found a lovely green pasture, cover it with beer cans, banana peels, milk cartons; and then, contemplating the debris, decide that the scenery is not as pretty as they had originally discovered it to be, and move on to the next one.

Thus, unstable suburban business areas were created which, by their poor planning, created their own decay. Such suburban shopping facilities—so-called shopping strips—were often disappointing.

In the last five years, however, the principle of PLANNING FOR SHOPPING has found expression in about a dozen regional suburban shopping centers. However, another two dozen, and a multitude of smaller ones, are in the construction stage or on the boards of planners and architects.

The results of PLANNING FOR SHOPPING have, up until now, become apparent only in suburban areas. Though REGIONAL SHOPPING centers are still young, some are moderately and some are extremely successful.

Does this mean that our city cores have to settle for slow but certain economic strangulation? Does it mean that our cities have to shrivel up, that our metropolitan areas will take the form of doughnuts, with all the dough on the outside and the emptiness of a ghost town in the center? Could our national economy afford such an event?

The questions "Can our cities be saved? Will they be saved? Are cities worth saving?" are merely academic. They not only can be saved, but they must be. The question before us is how.

It is a temptation to think of brand new cities, with a fresh start on open land. The lure is strong, but the basic premise of its realization is the irrevocable destruction of the present city. To destroy our present cities, or to accomplish the same result merely by leaving present ills unheeded, or by administering only skin-deep treatments, would end in economic catastrophe.

In trying to find the answer to the "how" of planning, we have a strong ally. This ally is the experience which we have gained in planning, implementing and operating the large regional shopping centers. They can become the pilot plants, the experimental workshops for the replanning of our city cores.

Obviously, the problem of reshaping an existing densely built-up city core is more complex than the one of planning a regional center on a cow pasture. And obviously there are important differences in other basic conditions which call for new planning approaches. Yet, all of the essential principles of PLANNING FOR SHOPPING will remain unaffected.

In order to illustrate my point, let us look closely at two actual projects, both the work of my office: The Northland shopping center in Detroit, Michican (which can, I think, be rightly regarded as an example of the highest standard in regional shopping center planning), and a master plan for the rehabilitation of the downtown area of a specific city, to which we will, because it cannot yet be publicized, refer to as "City X."

Northland serves a suburban trade area of about half a million people. It is built on a 160-acre site. It is planned for about one-and-a-half million square feet of rental area, of which about one million square feet have been constructed and leased. It has been in operation since spring 1954.

"City X" has a population of about 500,000 people and the city proper is surrounded by other towns and villages and communities which add considerably to the trading population. Its downtown area covers an area of approximately 300 acres.

Northland is located in the center of a vigorously growing suburban area. Downtown "X" is in the center of quite a number of such areas. There is certainly nothing wrong with the location of downtown "X". Thus the troubles which it now experience must be caused by something else.

The sites of Northland and of downtown "X" are both satisfactory from the point of view of their size, their shapes, their physical characteristics. However, vast differences become apparent if we compare their accessibility, which, in the case of Northland, is excellent after minor improvements

were made, but which, in the case of downtown "X", is poor and in need of complete overhaul.

There is also a great contrast in the characteristics of their surrounding areas. In Northland, about 300 acres immediately surrounding the site have been reserved for nuclei planned similarly to the shopping center concept, to serve other human needs and activities, such as regional health centers, office and laboratory centers, and recreational and entertainment centers. Further away are healthy stable residential areas. In the case of downtown "X", we find the site surrounded by non-conforming uses, slums, blighted areas, and only in the far distance do we find healthy residential growth.

Before starting construction, we found on the Northland site trees, lots of cows, and some barns. In project "X", we find the site densely built-up, with structures varying all the way from skyscrapers to one-story shacks of varying ages and states of repair.

In calculating the trade potential in Northland, we had the competition of an existing strong downtown area and of the rather strong suburban shopping facilities to consider. In project "X", we are concerned only with the competition of suburban facilities of which none, at least not yet, carries very great impact.

Thus, we might say that project "X" has the edge, as far as location and trade potential are concerned, but Northland is better off in accessibility, physical conditions of the site and characteristics of surrounding areas.

This much for basic conditions. Now let us consider planning principles.

There are, basically, four main planning goals:

1. *The most productive use of the land.*
2. *The free flow of traffic throughout the tributary area.*
3. *A non-conflicting pattern of traffic on the site* (that means separation of service traffic, pedestrian traffic and automobile traffic).
4. *The integration of commercial and non-commercial activities.*

When these goals are applied to the planning of our two projects, they find their expression in the following manner:

1. The Most Productive Use of the Land

In Northland, this was achieved by concentrating all commercial activities into a compact cluster of buildings with basements used for storage and services and for selling of certain merchandising categories, with stores grouped in such a manner as to minimize walking distances and servicing difficulties. Further, tenants with great power of attraction were so placed that they would assist the entire center in creating intensive shoppers' foot traffic.

In planning "City X", we proceed by elimination of obsolete structures and non-conforming uses and in creating a number of highly compact entities, well-connected with each other and with minimum walking distances within each of the entities.

2. The Free Flow of Traffic Throughout the Tributary Area

In Northland, we found a basically good system of roads connecting the tributary area with the site. A number of improvements, such as the increasing of the width of a number of highways and the construction of one new access road, as well as a new divided highway forming a loop around the center, were constructed in cooperation with the authorities.

In the case of "City X", we are planning not only the improvement of the arterial highway system and the construction of a loop road, but also improvements of public transportation by additional bus lines and a rapid transit system.

3. A Non-Conflicting Pattern of Traffic on the Site

To reach this goal, we built, in Northland, a parking area for 8,600 cars, with reserve space for another 3,000. Surrounding the building group we constructed separate roads for bus traffic, bringing passengers to a conveniently located bus terminal, and we channeled all service traffic underground, out of sight of the shoppers. We created completely separated pedestrial areas in the form of landscaped courts, malls, arcades, and lanes.

In the case of "City X", we followed the Northland procedure very closely. We are proposing parking terminals with a capacity of 60,000 cars, along the loop freeway which rings the central district. We bring buses, taxis and airport limousines onto public transportation loops which branch off the belt line freeway and penetrate the central district for depth of several hundred feet until they reach bus and taxi terminals. We construct an underground road system for all service activities. Finally, we plan to completely eliminate private surface vehicles from the heart of the city, thus creating landscaped pedestrian areas, similar to those of Northland.

In addition, we propose a system of a small electrical surface bus lines, using vehicles similar to the ones used in various world fairs, interconnecting various downtown sectors, such as the civic center, the theatrical and recreational center, the office building center, the shopping center, and so on.

4. Integration of Commercial and Non-Commercial Activities

In Northland, we have attempted to stimulate the social, cultural and civic aspects by providing a community center, an auditorium, a children's play area, a large number of public eating places and, in the courts and malls, opportunities for relaxation, exhibits and public events.

In "City X", we find that many of these elements already exist. By making them more accessible and by adding new elements, we plan to bring about an intimate relationship of cultural, civic, recreational and social activities.

With regard to "City X", we are facing still the problem of the surrounding areas. In order to safeguard the healthy functioning of the newly-reshaped downtown area, it is mandatory to redevelop these areas—by razing of slums and blighted areas, and by their replacement, not with institutional housing projects or new slums with plumbing, but with organic neighborhoods.

The implementation of the Northland plan was done by private enterprise. The implementation of "City X" will have to come about by concerted public and private action in forms for which precedents exist in many areas of civic endeavor.

Both plans, Northland and "City X", are based upon the realization that only the total integration of all planning activities, on the basis of an overall master plan, can bring results in our complex society. Both plans are bold; they could not be any less to achieve their purpose.

For the planning of regional shopping centers, we learned many a lesson from carefully watching and analyzing downtown activities. Now that large regional shopping centers have been planned, constructed and successfully operated, they are ready to pay back part of the debt owed to the old downtown district by serving as testing and proving grounds of ideas for the renewal of our city cores.

OPEN DISCUSSION

SPEED TRAPS AND SAFETY

By Kay Lorentzen (Mem., ITE)
Planning Engineer, Chicago Transit Authority, Chicago, Illinois

SPEED TRAPS WERE VERY COMMON some 30 years ago. People who had automobiles would drive out on a summer Sunday, often taking some friends along.

When they came to a little village there would be a little sign calling for a very slow speed, like 5 or 10 MPH. The sign would not be very conspicuous, it was not intended to be.

As they overlooked the sign and drove on through the village, a motorcycle policeman would stop them, a judge would be on hand, in spite of its being Sunday, and a fine imposed for exceeding the speed limit. This all happened before the Institute of Traffic Engineers and some of its members were on the scene.

The credit for stopping this kind of shakedown goes to the automobile clubs. The last speed trapper of this era in the Chicago area was Joe Hussar, who worked his trap on Western Avenue, Dixie Highway south of Blue Island. He went to jail, in fact he died in jail.

Somebody tried years later to revive this trap, and when asked by the judge "how come" they frankly admitted "that is the way we eat".

Today we have another kind of speed trap. A speed trap may be defined as a street or road which is wide enough, straight and smooth enough, and sufficiently free of obstructions limiting visibility, to permit driving at a certain speed but where the law nevertheless calls for a much lower speed.

With the car tracks paved over in most places by now, the city is full of places where speeds of 30 to 35 MPH can safely be used at least outside of rush hours but signs call for only 25 MPH. Worse than that, even where there are no 25 MPH signs, the speed limit is supposed to be 25 just the same. Where the highways enter the city there are big signs with the name of the city on but not a word about this invisible and silent speed limit.

It would seem that this kind of speed trap is much worse than any operated by the shakedown artists in the little villages in the 20's. They at least had an appearance of legality in that the sign was there, inconspicuous as it was. To make things worse yet, there are hundreds of signs in the city calling for 25 MPH speed limit, giving the impression that zones with this limit are thereby established and leading the unaware motorist to the obvious conclusion that where there are no such signs, there is no such speed limit either.

Presumably a person driving in from Wisconsin or Indiana—or even from the adjoining suburbs—is expected to drive promptly to City Hall or the nearest police station to find out if there is an invisible and silent speed limit in the city, and, if so, how much it is; an absurd procedure.

I will leave it to the lawyers to decide whether this invisible and silent speed limit violates the 6th amendment to the constitution against "unusual and unreasonable arrest and seizures"; also whether the city lays itself open to a taxpayers' suit for wasting a lot of money on 25 MPH signs when signs are not necessary to establish the limit.

Now, all these arrangements are of course made in the name of safety. I am as much impressed as anybody by the killing of 40,000 people a year in automobile accidents and intend to do all I can—whether it be much or little—to get us away from this disgraceful condition.

But I doubt if these speed traps promote safety. The average motorist considers them rather like a "cop and robbers" game; if he can "fool the cops" he feels fine; he will boast of it to others.

When a sign reads 25 MPH speed limit, it really means to say that "speeds in excess of 25 are not safe". Being impractical to jam so many words into a small sign, which can be read by motorists in passing, we just say "25 MPH speed limit."

But the drivers know that this is a lie in most cases—hence disrespect for the regulation. Twenty-five MPH may be as fast as a person can safely drive at certain hours of the day, like in the rush hour, but as it is not practical to tear the signs down after the rush and bring them back for the next rush hour, the signs are left up for 24 hours a day, 7 days a week, with a message which is only truthful on some days and then only for 3 or 4 hours, if that much.

A safe driver does not drive with his eyes glued to the speedometer. He will watch the road ahead, watch for vehicles coming out of intersecting streets (this even if he is on a through street), pedestrians on and off the sidewalk, cars making turns, dogs and — above all — children. The proper watching of all these potential dangers will keep his eye off the speedometer much of the time. He will drive as fast as he can safely go, and in most cases, at least outside of rush hours, his speed in a city will be in excess of 25 MPH.

Out of the thousands who drive their cars down our public streets, the police with their squad cars or motorcycles will pick up a few, comparatively speaking; there may be 25,000 moving arrests in a month's time (only part of them for speeding, so called), but in the same time 780,660 licensed cars and trucks will have made 25,000,000 trips, practically all of them in excess of posted speeds. In other words, enforcement of speeds is attempted in one case in every 1,000. If thieves and robbers were pursued by the police only at this rate, with 999 being left alone for every one apprehended, we would not think much of their police work.

On the *highways* speed may well be termed "Public Enemy No. 1", as one traffic engineer aptly called it, but driving on a city street is quite different. Excessive speed will aggravate an accident but the principal cause most often is something else. The Chicago Park District in its report for the first 6 months of 1955 ascribed speed as the principal cause of only 8.6% of their automobile accidents. In view of this, the great deal of attention paid to speed *in the city* hardly seems justified. We spend millions on signs, motorcycles and squad cars for speed trappers and wages for the trappers themselves, judges and clerks, etc.—all for the purpose of cutting down on a class of accidents which constitute less than 9% of the total. If these efforts and resources were directed against the other 91% of the accidents, we might achieve greater safety.

When a driver is accused of speeding, so called, and takes his case before the judge, he will find that the officer in the case is never on hand; he has to come back and waste another morning. Whether this is a deliberate attempt to wear the motorist down, or whether it just happened so, the few times I was accused of a violation I would not know.

But to whatever extent it is resorted, it certainly will help clog the courts with cases—in two ways, first because the case on hand is not disposed of, and second because the officer is free to be out and make out more "cases" for the court.

The motorist is not favorably impressed with this kind of "justice"; in 9 cases out of 10 he will have done nothing else than drive his car down a public street at a safe rate of speed and feels that he should not be before a judge at all.

This leads to the conclusion that the operation of speed traps does not promote safety. Any effort for safety or any safety campaign must have popular support in order to succeed. We might have learned from the "noble" experiment with national prohibition that an unpopular law, a law that is forced on the great majority of otherwise law-abiding citizens by some minority will breed disrespect not alone for that law but for laws generally. I trust safety campaigns will not share the fate of prohibition but get the popular support they deserve; they will need it.

The 25 MPH speed limit, besides being sneaky in its application, is unrealistic and antiquated; with modern cars during most hours of the day it is only crawl. It was established back in the 20's before the days of 4-wheel brakes; high pressure tires were also in common use then, presenting a much smaller area of contact with the pavement. If there must be a speed limit for city driving it should be at least 30, maybe 35. It costs a lot of money to buy a car, it costs a lot of money to run it, and the taxpayers and motorists have spent millions of dollars for widening of streets, new pavements, traffic signals and whole new streets and drives—all for the purpose of making driving safe at speeds better than a crawl.

In conclusion, lest somebody get the impression that I am merely picking on my home city, I have only used Chicago as an example because I know it best, but I have not the slightest doubt that the same conditions exist in most of the other large cities all over the country.

I believe the emphasis on speed is wrongly placed when dealing with *city* driving. If you hit a car when you are going 40 MPH, you will hit it harder than if you are only going 20, that is obvious; but why hit it in the first place? The Chicago Park District gave the answer, and in 91 cases out of 100 the principal cause of the accidents was something else than speed.

OPINIONS OF STATE TRAFFIC SAFETY OFFICIALS ABOUT VARIOUS ASPECTS OF THE SPEED SITUATION

The Accident Prevention Department of the Association of Casualty and Surety Companies, during this current year sent out 101 questionnaires to Enforcement Officials, Motor Vehicle Administrators, Traffic Commission Representatives, and Traffic Safety Bureau Representatives for the purpose of obtaining the opinions of these officials on various aspects of speed. There were 66 returns with all but one state represented among the replies. The questionnaire form and a summary of the results are indicated below.

1. Is it your impression that the people in your state are driving faster, slower or at just about the same speeds as they were, say, in 1947 or 1943?

FASTER	73%
ABOUT THE SAME OR SLOWER	27%

2. In your opinion, is there a high speed problem on the highways of your state today?

YES	91%
NO	9%

If YES, do you think that it is caused by relatively many drivers or by relatively few?

RELATIVELY MANY DRIVERS	33%
RELATIVELY FEW	67%

3. Would you say that the automobile speed situation in your state today creates a major problem for enforcement officers, a minor problem, or no real problem at all?

A MAJOR PROBLEM	77%
AN INSIGNIFICANT OR A MINOR PROBLEM	23%

4. Which *one* of the following statements cames closest to describing the way you feel about speed in relation to the occurrence of highway accidents?

Speed contributes more to the highway accident experience than does any other single factor	50%
Speed produces its share of highway accidents but is not the most important accident factor in the over-all picture	47%
Speed per se has little or no bearing on the over-all highway accident experience	3%

5. Do you agree or disagree that speed increases the severity of automobile accidents?

AGREE	100%
DISAGREE	0%

6. Which *one* of the following statements comes closest to describing the way you feel about speed control as a means of preventing highway accidents?

More highway accidents can be prevented through the strict control of highway speed than through any other single method	26%
Speed control is of value in highway accident prevention when combined with other traffic safety measures	74%

7. Is it your impression that the driving public has generally demonstrated the ability to judge safe speeds of travel under all highway conditions?

YES	20%
NO	80%

8. Which one of the following statements comes closest to describing the way you feel about the manner in which the subject of speed has been generally treated in the press and other public information media?

The "speed is not dangerous" theme has been overplayed; for balance, the point of view of those who maintain that speed is dangerous should be given more attention 26%

The "speed is dangerous" theme has been overplayed; for balance, the point of view of those who maintain that speed is *not* dangerous should be given more attention..... 21%

The public has been fairly equally exposed to both points of view 53%

9. Do you agree or disagree with the position that the modern highway and the modern car make it possible to drive safely at "high" speed?

AGREE 24%
DISAGREE 76%

10. In your opinion, does emphasis in automobile advertising on "power", "horsepower", "acceleration" and the like encourage faster driving?

YES 83%
NO 17%

11. Do you think that there should be a uniform absolute top speed limit for rural highways, nationwide?

YES 53%
NO 47%

If YES, what top daytime limit would you favor?
60 mph
What top nighttime limit? 50 mph
If NO, what top limits do you think appropriate for your own state? Daytime 60 mph
Nighttime 50 mph

12. Do you think that there should be a uniform absolute top speed limit for multiple lane, limited-access highways, nationwide?

YES 64%
NO 36%

If YES, what top *daytime* limit would you favor?
60 to 65 mph
What top nighttime limit? 50 to 60 mph.
If NO, what top limits do you think appropriate for such highways, if any, in your own state?
Daytime 55 to 60 mph
Nighttime 50 to 55 mph

13. Whatever top speed you consider proper for the modern "super highway", do you agree or disagree with the principle of a system of downward zoning for all other types of highway and for varying conditions of vehicular and pedestrian traffic congestion?

AGREE 98%
DISAGREE 2%

14. Is your idea of "speed" confined to *speed per se*, or do you think of it more as a combination of things like driving too fast for conditions, following too closely, risky passing and others?

SPEED PER SE 27%
COMBINATION OF RELATED THINGS 73%

15. Taking all things about ordinary highway travel into consideration, what is the top driving speed at which you generally feel "safe"?

60 mph
(by 73% of the replies)

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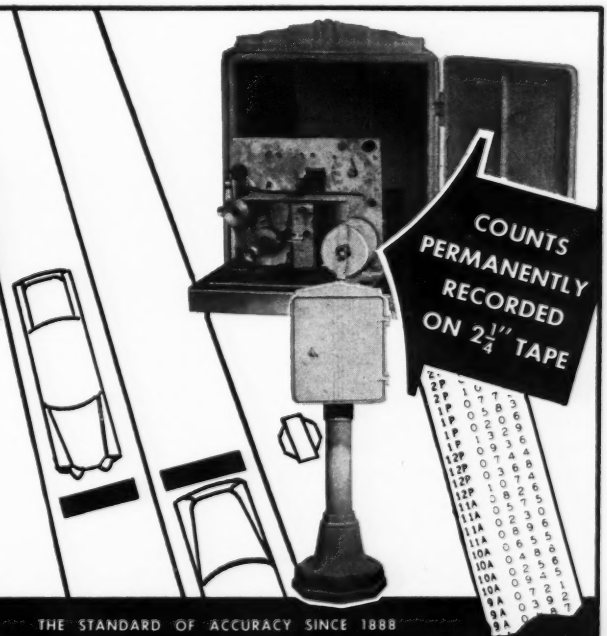

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TRAFFIC NEWS

Marsh Made Honorary Member

Burton W. Marsh, one of the Institute's charter members, its second president, and the first traffic engineer in our country, became the fourteenth honorary member in the history of the Institute of Traffic Engineers when President

Institute of Traffic Engineers President Charles W. Prisk (left) presents Honorary Membership Certificate to Burton W. Marsh, a founder member and the second President of the organization, during its Annual Meeting in Pittsburgh last October.

Prisk presented a certificate of honorary membership to him at the annual banquet on the evening of October 26, 1955. Following the presentation, Mr. Marsh spoke of his deep appreciation and concluded his remarks by laying down a challenge to the younger men that will be long remembered by those who were present.

Mr. Marsh graduated from Worcester Polytechnic Institute in 1920 with a Bachelor of Science degree in Civil Engineering, and the following year he attended the Yale University Graduate School. Upon the completion of his formal education he joined a consulting engineering firm and participated in city planning, zoning, traffic planning, major street planning and school studies in a number of cities including Worcester, Massachusetts; New Haven, Connecticut; Springfield, Massachusetts; Norfolk, Virginia and Dayton, Ohio.

In November 1924 he accepted the position of Traffic Engineer in Pittsburgh, Pennsylvania and thereby became the nation's first traffic engineer. After six years in this capacity, Burton Marsh moved to Philadelphia where he was Traffic Engineer from 1930 until 1933. While serving as Traffic Engineer in these two cities he wrote a number of papers on such subjects as standardization of traffic signs; planning of highway and street intersections; use of accident records and highway traffic control. These publications helped stimulate appreciation for good traffic engineering practice.

In 1933 Mr. Marsh was appointed Director of the Traffic Engineering and Safety Department of the American Automobile Association, a position he still holds. Under his guidance the traffic engineering and highway safety operations have greatly increased to specialized staffs devoted to traffic problems, highways, elementary school safety, school safety patrols, pedestrian protection, and high school driver education.

Although his duties with the American Automobile Association have expanded, he still devotes much of his time as a participant in various capacities in a number of national conferences and committees. He is an executive committee member and past chairman of the Highway Research Board and has been active in the American Society of Civil Engineers and the American Public Works Association. He has long been a member of the National Committee on Uniform Traffic Training, and is on the Board of Consultants for the ENO Foundation for Highway Traffic Control. Mr. Marsh also serves as a trustee of his alma mater, Worcester Polytechnic Institute, is a member of the honorary research society of Sigma Xi, and Tau Beta Pi honorary scholastic society.

In January of this year Mr. Marsh received the Highway Research Board's Roy W. Crum Award for distinguished service in recognition of outstanding achievement in the field of highway research.

Honorary membership in the Institute is bestowed on individuals who have performed notable and outstanding service in the interest of the profession of traffic engineering. Burton W. Marsh is a worthy recipient, having unselfishly devoted his entire life to the traffic engineering profession.

Final Report of Washo Road Test

A final report on the WASHO Road Test has been released by the Highway Research Board, giving test data, analyses, and findings.

Among the many significant findings contained in the 212 page report are these:

Asphaltic surfacing of shoulders increases greatly the durability and load support value of pavements. The results of the test, in this connection, support the practice of a number of states that provide shoulder paving as a part of their construction standards. In addition to the structural value of paved shoulders, the test demonstrated that they will provide an added factor for safety.

Test sections with four inch surface course were far superior to sections with two inch surface courses and comparable total depth pavements. Also, pavements with four inch surface course showed load support capacities comparable to three inch to nine inch deeper pavements where a two inch surface course were used.

A special publication containing highlights of the WASHO Road Test report is being prepared by the National Highway Users Conference and will be available for distribution in the near future.

Chicago Metropolitan Area Traffic Survey Begins

A comprehensive origin and destination traffic survey which will take 3 years to complete and cost approximately $1,600,000 started last October in Chicago. The federal government will pay one-half of the costs.

J. Douglas Carroll (Aff. Mem. ITE) is the project director, and he and his staff went to Chicago directly upon the completion of a similar study in Detroit. The headquarters of this special survey group is in the State Building in downtown Chicago.

A survey committee composed of R. H. Harrison, Division Engineer, Bureau of Public Roads; Ralph Bartelsmeyer, Chief Engineer, Illinois State Division of Highways; George Dement, Chicago Commissioner of Public Works, and

William J. Mortimer, Cook County Highway Superintendent will represent the four government units. T. D. Peppard, Engineer, Bureau of Public Roads; Frank Houska, Research Engineer, Illinois State Division of Highways; Edward A. Larozza, Civil Engineer, City Bureau of Engineering, and L. G. Wilkie, Traffic Engineer, Cook County Highway Department are members of the technical committee who will work closely with Mr. Carroll and his staff.

The survey will include all of Cook County and extends into adjacent counties. The major portion of the survey will be the standard internal-external survey with home interview technique being used internally and the direct roadside interview being used at the outer cordon line.

Toledo Tries New Downtown Plan

Two of the most unique traffic and transportation experiments in American transit history began during December in Toledo, Ohio as a result of cooperation between Community Traction Co., city council and downtown businessmen.

The experiments, both on a trial basis, were launched in two distinct steps. The Traction Company first put into effect a Downtown Neutral Fare Zone plan. This was followed in five days by the voluntary action of the Toledo City Council which virtually eliminated downtown on-street parking.

C. H. Forsgard, president of The Traction Company carefully refrained from requesting any definite action on the part of council or any other group, before effecting the Neutral Zone plan. First announcement of the company's program came early in November. This plan provided a pay-enter fare collection on in-bound bus trips and a pay-leave plan for out-bound trips. The 24-block area downtown was established as a Neutral Zone with no fare collected in the section and passengers permitted to enter or leave buses through front or rear doors.

Although there was no definite tie-in of the company's program with any suggested changes Mr. Forsgard did indicate that success of the Neutral Fare Zone plan would depend on the facility with which all traffic could move through downtown streets.

Immediately after the company's announcement of the Neutral Fare Zone plan the Downtown Toledo Associates, a group of downtown businessmen who have a long-range program under way for revitalizing the downtown area, joined in the drive to help effect the new bus fare program.

The Traction Company, meanwhile, supplemented its own advertising program explaining the Neutral Fare Zone plan, and even publicized the fact that Toledo has ample off-street parking facilities for autoists who do not use mass transportation.

The Traction Company prepared 300,000 folders for similar distribution showing locations of off-street parking facilities.

The Downtown Toledo Associates enlisted support of city council members. Toledo's Vice Mayor Ned Skeldon presented legislation for the virtual elimination of parking on downtown streets which included elimination of 338 on-street metered parking places. Further limitation during rush hours of parking on main thoroughfares leading to the downtown section was provided in the program.

Representatives of Downtown Toledo Associates were joined by the Toledo Chamber of Commerce and other council members who pointed out that piecemeal attacks on the problem would not be effective and would be more difficult to enforce.

The *Toledo Blade* and *Toledo Times* took a strong editorial stand in favor of the overall parking elimination program. After two council sessions the legislative body by an eight to one vote approved the more drastic parking elimination program.

(Continued on page 173)

Antique Autos Parade to Inaugurate New Signal System

Philadelphia to Electronically Control 75 Intersections

Seventy-five intersections along Broad Street in Philadelphia are being interconnected with a nerve center located in the basement of the City Hall. When this system is complete there will be 233 detectors, 24 miles of cable, three master controllers, 75 local controllers, and 75 pedestrian push-button units.

The nerve center receives impulses from detectors which count traffic movements on Broad Street and cross streets and computes automatically the best cycle length for north and south movement separately. Again automatically, the electronic equipment computes the most efficient cycle for the combined north and south movement and for cross traffic movement.

This installation is the fifth of its kind in the world and by far the largest. Los Angeles has a similar system of 25 intersections, while smaller systems exist in New Orleans, Vallejo, California and Baltimore.

The cost of installation is estimated to be $285,000 and all installation work is being performed by crews of the Traffic Engineering Section under the direction of Richard A. Overmeyer (Assoc. Mem., ITE), Assistant City Traffic Engineer.

Traffic Engineering Featured at 43rd National Safety Congress

Traffic engineering was on its own at the 43rd National Safety Congress, held in Chicago, October 17-21, 1955.

Just 25 years ago, a similar National Safety Congress held in Pittsburgh, witnessed the professional birth of traffic engineering — the organization of the Institute of Traffic Engineers. This year, the maturity of the profession was underscored by its prominence in the program of the Traffic Section of the Traffic and Transportation Department of the National Safety Council.

D. Grant Mickle, Director of the Traffic Engineering Division of the Automotive Safety Foundation, opened the Traffic Section program on Monday

D. Grant Mickle

afternoon by delivering an outstanding Beecroft Memorial Award Lecture on "Traffic Engineering". Discussing the need for a master traffic plan, integrated with over-all city planning, Mickle declared that the governmental structure for administering city traffic facilities is often antiquated and inefficient. He emphasized the need for centralized control and authority to permit the proper functioning of this vital phase of public administration. In a look at the future, Mickle said bold, intelligent planning can lick a problem many people describe as hopeless. In the history of the American republic and in the traffic field, too, he said, there are many examples of impressive victories won by American energy and ingenuity.

Some of the points in Mr. Mickle's monograph were underscored following the lecture in brief prepared discussions by Alger F. Malo, Director of the Department of Streets and Traffic in Detroit, Michigan; Henry A. Barnes, Director of Traffic for Baltimore, Maryland; and Joseph E. Havenner, Manager of the Public Safety Department of the Automobile Club of Southern California.

The afternoon also included a paper by John O. Moore, Director the Automotive Crash Research Project of the Cornell University Medical College, and a symposium on the subject of "Design Factors in Automotive Safety", in which representatives of Ford, General Botors and Chrysler participated.

That evening, the Midwest Section of the ITE was host to over sixty members and guests at a dinner meeting. In the absence of the scheduled speaker, Burton W. Marsh, who was ill with a cold, Joseph E. Havenner did a fine job of pinch-hitting.

The General Session on Tuesday morning centered about the theme "What Other Associations Are Doing". The administrative head or top officer of seven national associations reported on the activities of their organizations, especially as they related to the field of traffic safety. Harry Poter, Jr., in his capacity as President of the Institute of Traffic Engineers, reported on the program and goals of the Institute. Other organizations represented were the American Association of Motor Vehicle Administrators, Traffic Court Division of the American Bar Association, the Traffic Division of the International Association of Chiefs of Police, the National Education Association, and the President's Committee for Traffic Safety.

One of the highlights of the week was the "Great Debate" on Tuesday afternoon. The question "Are We Making Reasonable Progress in Traffic Safety" was debated by four of the top authorities in the traffic safety field. Moderated by Arnold H. Vey, Manager of the Traffic and Transportation Department of the National Safety Council, the program was carried out along formal debating lines, with the participants timed by a traffic control signal in the rear of the room. Arguing in the affirmative were Burton W. Marsh, Director of the Traffic Engineering and Safety Department of the American Automobile Association and M. R. Darlington, Jr., Managing Director of the Inter-Industry Highway Safety Committee. On the negative side of the question were T. N. Boate, Manager of the Accident Prevention Department of the Association of Casualty and Surety Companies and James H. Lake representing Norman Damon, Vice-President of the Automotive Safety Foundation, who was unable to be present because of illness.

In summing up, Mr. Vey asked the audience to vote — but in an unusual way. He asked each person to vote to himself as to whether or not he thought he or his organization were making reasonable progress in traffic safety in his community.

Following the debate, an hour of the latest traffic safety films was presented. Among the films shown were the following: "The Case of Officer Hallibrandt", an excellent story treatment of the problems faced by a traffic policeman and produced by the Ohio Oil Company; "Don't Skid Yourself", a documentary on the activities and results obtained during the Winter Driving Tests of the Committee on Winter Driving Hazards and produced by the Aetna Life Affiliated Companies; and "The Last Mile", a story of the perils connected with highway construction and produced by the Caterpillar Tractor Company.

Wednesday morning was devoted to four simultaneous group sessions—for Police, Public Safety Educators, Traffic Court Judges, and Engineers. Richard O. Bennett, Traffic Consultant for the National Association of Automotive Mutual Insurance Companies, presided over the Engineering Group Session which was devoted to the theme "Let's Tell the Public What We're Doing". The first speaker, discussing "What the Public Wants", was Bob Eastman, Chairman of the Traffic Commission of Oklahoma City. As a representative of public officials, Eastman stated that the public "expects miracles" but will be satisfied with reasonable controls and regulations if they understand what is involved. His challenge was picked up by Henry A. Barnes, Director of Traffic for Baltimore, Maryland, in his discussion of "What's the Pitch". Barnes stated that many public officials do not even attempt to remedy certain problems that "cannot be done". People are reasonable, he said, and are willing to listen if they are approached in a frank, direct and authoritative manner. "How to Do It" was the natural climax to the program, presented by Tom Killeen, Senior Publicist of the Department of Streets and Traffic in Detroit, Michigan. Killeen outlined the various media available to traffic engineers for the purpose of informing the public of their activities and plans. He described how each public information outlet could be used and explained the

(Continued on page 173)

TOLEDO TRIES NEW DOWNTOWN PLAN

(Continued from page 171)

Police set about to put this in effect within one week. Part of the overall program requested the specific assignment of police officers to manually direct traffic movements throughout the trial period of the parking elimination plan.

Expected success of the combination parking restriction, neutral zone experiment was foreshadowed by a CTC survey, Mr. Forsgard stated. Stop watch tests of bus runs along a main thoroughfare which in November was cleared of parking during rush hour periods showed time on runs being trimmed up to 33 percent.

It was more than a year ago that a Citizens Transit Study Committee launched an investigation of traffic problems and how these problems affect movement of mass transportation vehicles in Toledo.

In its report, the committee said:

"Mass urban transportation is the safest and most economical form of travel available to the public.

"We recognize the indispensability of adequate public transportation facilities to the sound growth and economic stability and welfare of our city.

"One important element in the efficiency and economy of (CTC) operation is the streets over which it operates its buses. The city has a definite obligation to the transit system and to the public for whom the system is operated to control this facility (the streets) so that the transit operator can attain, provide and maintain reasonably efficient and economical public transportation."

TRAFFIC ENGINEERING FEATURED AT 43rd NATIONAL SAFETY CONGRESS

(Continued from page 172)

very simple and logical steps which should be taken to make maximum use of the facilities available. It is planned to reproduce these three papers in an early issue of TRAFFFIC ENGINEERING.

An experiment which proved to be highly successful filled Wednesday afternoon with a variety of activities. Ten simultaneous open discussion groups were held, each attended by between ten and fifty people. Instead of formal papers or prepared discussions, people were invited to ask questions or informally discuss subjects of interest to them, included in the following categories:

New Accident Report Forms
Do Speed Limits Have An Effect On Accidents
Signs, Signals and Markings—Messages of Safety
Automobile Seat Belts—Pro and Con
What Is the Matter With Motor Vehicle Inspection?
Let's Improve Our Drivers
Promotional Idea Exchange
Should We Use Electrical Timing Devices
Teaching Traffic Safety to the Pedestrian
Using Teen-agers in Local Safety Programs

Thursday morning was devoted to brief reports on the four group sessions and ten discussion groups scheduled the previous day, for the benefit of those who were interested in the various subjects but could not attend all the sessions.

That afternoon delegates had their choice of two activities, a field trip or a joint session in cooperation with other Sections of the Council. The field trip included a tour of parking facilities, expressways and housing redevelopment in Chicago. The trip was climaxed by a tour of the impressive new officers of the American Bar Association.

The subject of "Child Safety" was discussed in a session jointly sponsored by the Traffic, Home, Farm, Women, and School and College Divisions. Among the speakers was Gordon Lindquist, Assistant Director of the Safety and Traffic Engineering Department of the Chicago Motor Club.

Another successful innovation of this Congress was the series of Early Morning Orientation Lectures presented from 8:00 A.M. to 9:00 A.M. Each of three mornings was devoted to a discussion of the basic fundamentals of each of the three E's and their place in the field of Traffic safety. On Tuesday morning the subject of "Enforcement" was covered by Ray Ashworth, Acting Director of the Northwestern University Traffic Institue. "Traffic Engineering" was reviewed thoroughly by Fred W. Hurd, Director of the Yale Bureau of Highway Traffic, on Wednesday. Thursday saw "Traffic Safety Education" presented by Dan Hollingworth, Manager of the Oklahoma City Safety Council.

The several experimental sessions and innovations were very gratifying and resulted in an extremely valuable and informational week. The emphasis placed on traffic engineering at the National Safety Congress was significant in this Silver Anniversary Year of the Institute and pointed up the increasing awareness of the unity and inseparable nature of accident prevention and traffic facilitation.

LOOKING AHEAD

JANUARY 30-FEBRUARY 3—NEW YORK, N. Y.
Winter General Meeting of American Institute of Electrical Engineers, Hotel Statler.

FEBRUARY 26-29 — ST. LOUIS, MISSOURI
Annual Convention and Exhibit, National Electric Sign Association, Jefferson Hotel.

FEBRUARY 28-MARCH 1—URBANNA, ILLINOIS
Forty-second Annual Illinois Highway Engineering Conference, University of Illinois.

MARCH 1 & 2 — URBANNA, ILLINOIS
Eighth Annual Illinois Traffic Engineering Conference, University of Illinois.

MARCH 4-6 — ATLANTA, GEORGIA
Southern Safety Conference and Exposition, Biltmore Hotel.

MARCH 12-16 — CHICAGO, ILLINOIS
National Electrical Manufacturers Association, Edgewater Beach Hotel.

MARCH 18-24 — WASHINGTON, D. C.
Consecutive Meetings and Co-Exhibit of the American Congress on Surveying and Mapping and American Society of Photogrammetry, Shoreham Hotel.

MARCH 18-21 — PORTLAND, OREGON
Spring Meeting of the American Society of Mechanical Engineers, Multnomah Hotel.

APRIL 30-MAY 2 — WASHINGTON, D. C.
Annual Meeting Chamber of Commerce of the United States.

SEPTEMBER 17-20 — ST. LOUIS, MISSOURI
Annual Meeting, American Transit Association, Jefferson Hotel.

SEPTEMBER 25-28 — SAN FRANCISCO, CALIFORNIA
Annual Meeting of the Institute of Traffic Engineers, Mark Hopkins Hotel.

OCTOBER 22-24 — NEW YORK, N. Y.
Thirty-eighth Annual Meeting American Standards Association (in conjunction with Seventh National Conference on Standards), Hotel Roosevelt.

OCTOBER 22-26 — CHICAGO, ILLINOIS
Forty-fourth National Safety Congress & Exposition, National Safety Council.

New Appointments . . .

Keefer Joins Florida State Road Department

Louis E. Keefer (Jr. Mem., ITE) has recently taken a position as Assistant Engineer of Planning with the Florida State Road Department's Traffic and Planning Division. Before moving to Tallahassee, Keefer was Assistant Traffic Engineer for the Planning Division of the West Virginia State Road Commission.

Louis E. Keefer

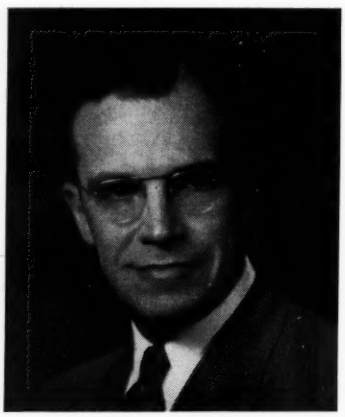
A native of Wheeling, West Virginia, "Jerry," as he prefers to be called, entered the Army in 1943 as an ASTP basic engineering candidate at West Virginia University. When that program abruptly ended, he served in the Transportation Corps in France and the United States until 1946. He returned to Charleston, West Virginia after service where he received a B.A. in economics from Morris Harvey College in 1950.

He spent the next two years at a drafting table, resigning to attend West Virginia University (again) where he received an M.A. in economics in 1953. He first became interested in traffic and planning following his return to the West Virginia State Road Commission, when he did traffic and economic research and writing for the Automotive Safety Foundation's Highway Needs Study completed in 1954. He attended the Yale Bureau of Highway Traffic as an ASF fellow, graduating in 1955.

Jerry's work in Florida will be largely concerned with highway sufficiency ratings and other highway planning activities. He spends his spare time writing fiction for the amusement of his wife, Lolly, and playing chess, (by mail if there are any challengers.)

Billings Heads Cleveland Safety Council

William E. Billings (Member, ITE) was elected Executive Vice-President and Secretary of the Cleveland Safety Council effective October 1, 1955, assuming direction of all Council activities. He brings to the Safety Council an extensive experience in transportation and industry with wide contacts in the governmental and organizational fields.



William E. Billings

Graduation from Harvard Engineering and Business Schools with honors was followed by a year of training at the Harvard Bureau for Street Traffic Research and a course in Work Simplification at Massachusetts Institute of Technology. Later educational activities included lectures at the Yale Bureau of Highway Traffic, instructor in public speaking at University of New Hampshire evening classes and of Traffic Engineering at Fenn College, Cleveland. As a result of his educational and professional contacts he is the author of several publications and pamphlets of wide distribution.

Industrial and business experience was acquired through employment, generally in engineering capacities, with the American Oil Company, Cambridge, Massachusetts and Liberty Mutual Insurance Company, Boston, Massachusetts. With the latter company he developed accident prevention programs for industrial, trucking, construction and mercantile policyholders in the northeastern and east central states.

As Director of the Insurance Company's Traffic Safety Bureau, Mr. Billings concerned himself with traffic problems of municipalities and driver training. He guided the Traffic Safety Program of the U. S. Junior Chamber of Commerce and served on the President's

(Continued on page 177)

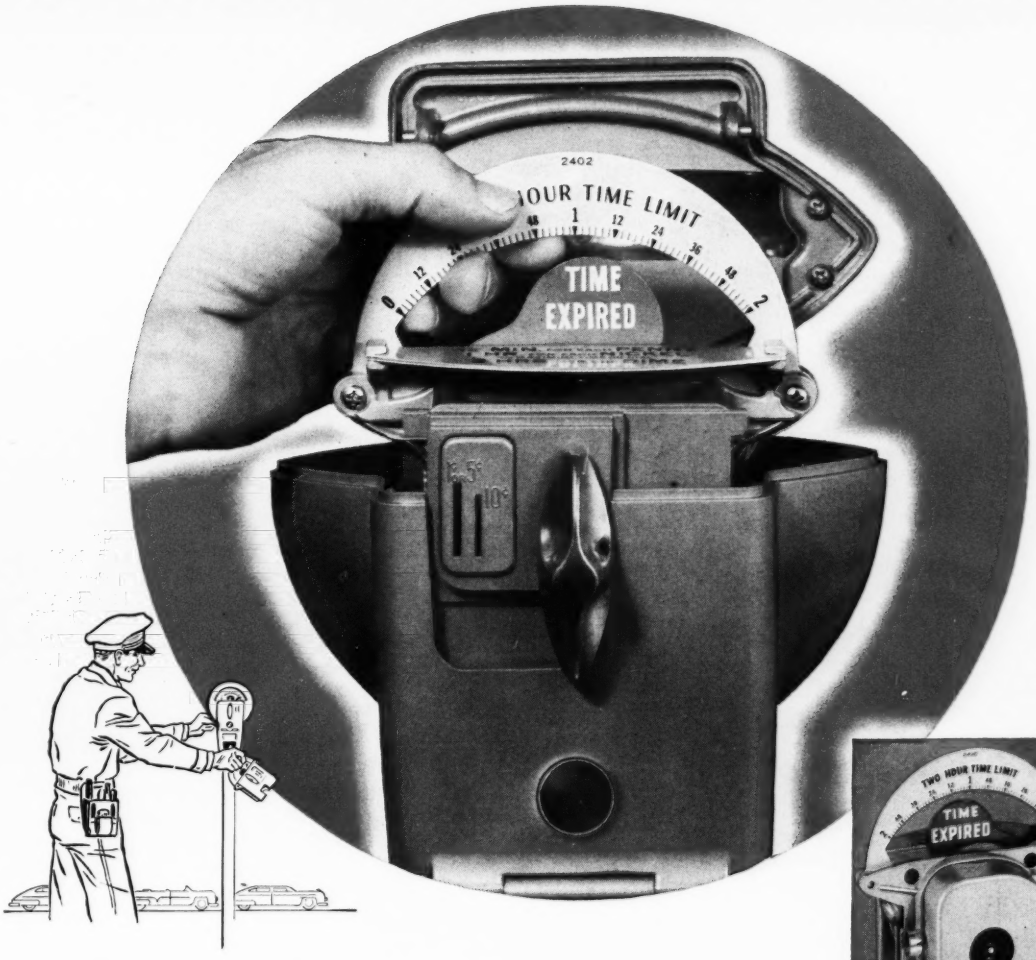
Hartley Becomes City Traffic Engineer

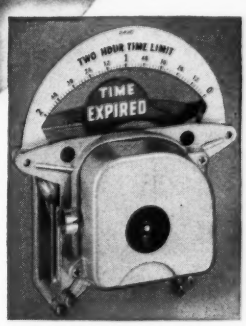
John E. Hartley (Jr. Mem., ITE) has accepted an appointment as Traffic Engineer for the City of Springfield, Illinois. Hartley, 29 years of age, was born in Port Chester, New York, but has lived in Detroit since 1937.

John E. Hartley

He attended high school and college in Detroit, graduating from the Lawrence Institute of Technology with a Bachelor of Science degree in Mechanical Engineering. In 1953 Hartley received a certificate in highway transportation from the Bureau of Highway Traffic at Yale University.

He joined the Detroit Department of Streets and Traffic in 1952 and has been with this organization since, except for time spent at Yale. For a little over two years Hartley has held the title of Assistant Traffic Engineer and has been assigned to the Traffic Signal Section. A veteran of the U. S. Naval Air Corps, Hartley and his wife, Eleanore, plan to moved to Springfield November 7.





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There's fresh hope for congested city traffic. The new Electro-Matic® Master brings coordinated automation to traffic flow in large city areas. The centrally located system does all the complex electronic thinking to move traffic along miles of thoroughfares, smoothly and more efficiently than ever before possible.

The electronic brain of the computer system evaluates thousands of traffic details received electronically from the detectors at dozens of intersections. With astonishing speed it **automatically** instructs each individual traffic light what to do and for how long. With every traffic change, the Electro-Matic Master changes its instructions. If traffic is predominantly heavy northbound, or southbound, or crosstown, or because of special situations, weather, time of day, or circus or football crowds, the computer knows this and adjusts for it.

Most important, by knowing the overall situation, unusual conditions at any intersection are not allowed to influence the smooth flow of traffic over the entire area. This ability to see the forest despite the trees does more to break bottlenecks and improve a large city's traffic conditions than can readily be imagined.

The Electro-Matic Master is adaptable to grid or arterial systems. To discover how it can **automatically** handle your city's traffic, write for Bulletin E-222.

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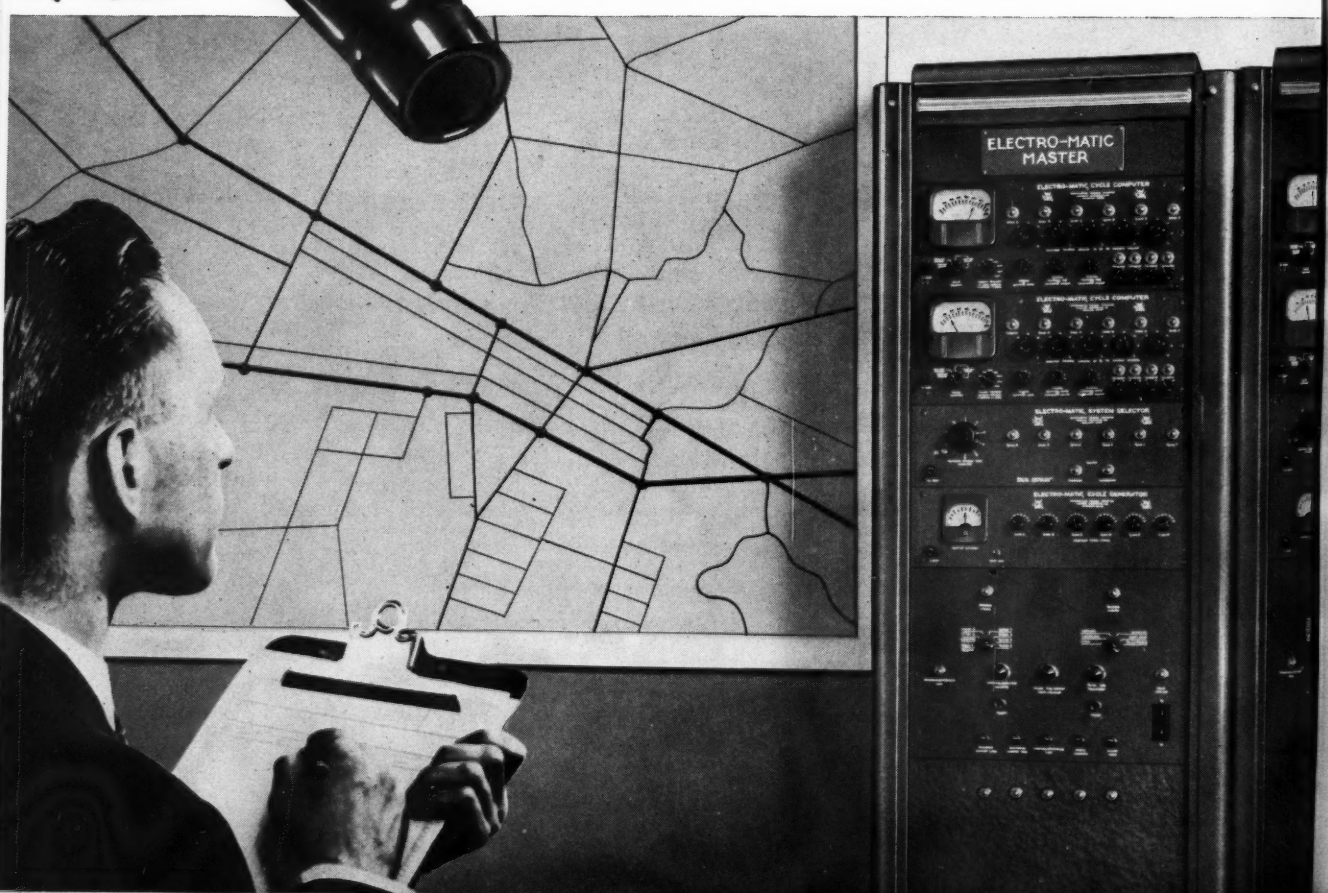

Kunde Accepts Miami Traffic Engineering Position

The City of Miami, Florida, recently appointed George H. Kunde (Jr. Mem., ITE) Traffic Engineer in the newly-created Division of Traffic and Transportation. Mr. Kunde will have complete

George H. Kunde

responsibility of all traffic engineering in Miami.

He has made remarkable progress in the field of traffic engineering in Florida by first serving as Miami's Traffic Planning Engineer, later as a traffic engineer with the Rader Engineering Consulting Firm, and directly before he accepted his new position was Miami's Assistant Traffic Engineer under Earl J. Reeder.

After graduating from Miami Beach High School, he received a B.S.E.S. degree from the University of Miami. His military career lasted for forty-two months as a pilot in the United States Air Force.

In addition to being a Junior Member in the Institute, George is a member of A.S.M.A, Junior Member of the Florida Engineering Society, Member of the Professional Engineers Association, and a registered professional civil engineer in the State of Florida.

He is married and has two boys and a girl. One boy is 10, another 8, and the girl is 5. His extra-curricular activities include married life and skin diving.

When You Change Your Address

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ITE Sustaining Organizations

A'G'A Division of Elastic Stop Nut Corporation of America
1027 Newark Avenue — Elizabeth 3, New Jersey
Attention Mr. Irving J. Mack
Sustaining Organization Representative

American Transit Association
292 Madison Avenue — New York 17, New York
Attention Mr. George W. Anderson
Sustaining Organization Representative

Automatic Signal Division, Eastern Industries, Inc.
Regent Street — East Norwalk, Connecticut
Attention Mr. Paul L. Green
Sustaining Organization Representative

California Metal Enameling Company
6904 East Slauson Avenue — Los Angeles 22, California
Attention Mr. Standish K. Penton
Sustaining Organization Representative

Crouse-Hinds Company
Wolf and Seventh North Street — Syracuse, New York
Attention Mr. Kenneth W. Mackall
Sustaining Organization Representative

General Electric Company
Outdoor Lighting Dept. — Hendersonville, North Carolina
Attention Mr. D. T. Carter
Sustaining Organization Representative

The Grote Manufacturing Company, Inc.
Bellevue — Kentucky
Attention Mr. W. E. Miles
Sustaining Organization Representative

Hawkins-Hawkins Company, Inc.
1255 East Shore Highway — Berkeley 10, California
Attention Mr. Norman L. Hawkins, Jr.
Sustaining Organization Representative

Lyle Signs, Inc.
2720 University Avenue, S.E. — Minneapolis, Minnesota
Attention Mr. R. H. Bjorklund
Sustaining Organization Representative

Magee-Hale Park-O-Meter Company
Commerce Exchange Building — Oklahoma City 2, Oklahoma
Attention Mr. G. A. Hale
Sustaining Organization Representative

The Marbelite Company, Inc.
27 Warren Street — New York 7, New York
Attention Mr. William E. Lenz
Sustaining Organization Representative

(Continued on page 180)

BILLINGS HEADS CLEVELAND SAFETY COUNCIL

(Continued from page 174)

Highway Safety Conference, National Committee for Traffic Safety and Highway Standards Committee of the American Standards Association.

Experience in traffic was further augmented as Director of Transportation and Engineering, Cleveland Automobile Club which involved traffic engineering consulting servces to numerous communities, membership on the Traffic Engineers Advisory Committee to the Ohio Study Committee and secretary of the Mayors Traffic Safety Committee and of the Transportation Panel of metropolitan Cleveland.

His most recent responsibility during the last three years was Administrative Assistant and Traffic Engineer to the Regional Planning Commission. Office, administrative and engineering consulting experience acquired there should prove invaluable to safety council management.

He is a registered Ohio Professional Engineer, member of the Cleveland Engineering Society and Tau Beta Pi, and past member of the American Society of Safety Engineers and American Society of Automotive Engineers.

His birthplace is Grand Rapids, Michigan, was married in 1937 to Florence Canfield Billings, Wheaton College, Norton, Massachusetts, and has a daughter, Gail, 14. They now live at 2307 Ardleigh Drive, Cleveland Heights 6, Ohio.

This timer unit assures performance, accuracy, dependability and rugged durability in these two famous products

This aircraft Flight Recorder, manufactured by the Mechanical Division of General Mills, etches a continuous 300-hour record of heading, air speed, vertical acceleration and altitude on aluminum foil. The recording device, enclosed in a specially fabricated sphere, is designed to withstand shocks up to 100 G's and to resist temperatures of 2000 degrees F, up to 30 minutes in duration.

The sturdy Park-O-Meter, produced by the originators of metered parking, uses this same dependable timer unit in construction of the leading meter for on- and off-street parking control. This snap-on unit, in its dust and moisture tight case, keeps your meters working full time and reduces maintenance service to an unbelievably low minimum. Park-O-Meter costs more to build but saves your city money.

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SECTION NEWS

CANADIAN SECTION

Taken from Canadian Newsletter, **Grant Bacchus,** Editor.

Walter Macnee has been leading a very active existence the past six weeks. After a flying trip to Banff, Alberta where he addressed the Canadian Good Roads Association, he was busy packing to move into his new house in Toronto's Don Mills Development. Right after moving he again boarded a plane for a week's visit to various U.S. Toll Roads with the Ontario Select Committee on Toll Roads to which he has been appointed as technical advisor. He then decided to give his wife a break by taking her to the Pittsburgh convention for a holiday.

Jacques Barriere reports that the newly formed Traffic Engineering Department in Montreal is beginning to take shape under Director **Jean Lacoste. Jacques** has also been appointed secretary of the Traffic Sub-committee of the C.G.R.A.

Harry F. Burns writes that he is resigning his post of Traffic Engineer of the City of Winnipeg to accept a position with A. D. Margison and Associates, Consulting Engineers, in Toronto. His last major accomplishment in Winnipeg appears to have been some excellent signing and design of the new Midtown Bridge. Travel time on the new bridge is about ⅓ that formerly required using the Main St. and Osborne St. Bridges. Travel time during rush hours has been reduced by over 50%! Harry received a considerable amount of praise from the press for his efforts.

MISSOURI VALLEY SECTION

Work is progressing on Kansas City's new 6th Street Trafficway. This facility and its interchange connections will carry U.S. Routes 24, 40, 71, Alternate 69 and Alternate 169. Two of the main connections across the Missouri River between Kansas City North and Kansas City South, will enter and merge with this trafficway system.

Kansas City's new 1200 car underground garage will shortly open its doors to the public. Situated next door to the Municipal Auditorium and Music Hall, the garage is near the heart of the hotel and shopping section.

The Missouri Valley Section was represented at the Pittsburgh Meeting by nine members. All agreed that the Pittsburgh membership should be heartily congratulated for staging a splendid meeting. Since several of the MV Section members still bear scars from the long hours of work during the Kansas City Meeting, they were able to appreciate more fully the fine work exhibited by the Pittsburg clan. A sincere pat on the back from MV to Pittsburgh.

Leon W. Corder
Associate Editor

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NEW ENGLAND SECTION

Forty-five members and guests met in New Haven on November 2 for the first of the 1955-1956 Section meetings. **Newman E. Argraves,** Connecticut's Highway Commissioner, helped get the series off to a successful start. Armed with a few notes and a complete knowledge of his subject, Commissioner Argraves spoke to the group on Limited Access Highways. He put special emphasis on Connecticut standards for limited access design as they affect the building of the Connecticut Turnpike. This important 105 mile toll facility will go directly through Connecticut's most important traffic corridor. It is scheduled for opening in 1957. Commissioner Argraves' interesting, informal talk about it made for a particularly worthwhile meeting.

New Officers for the Section are **Fred Hurd,** President; **Dave Johnson,** Vice President; and **Roger Chandler,** Treasurer. **Roger** may find the coming year a trying one—he inherited a —.34 treasure in the treasury. And, speaking of **Roger,** he brought a cheering section

ITE SUSTAINING ORGANIZATIONS

(Continued from page 177)

Minnesota Mining & Manufacturing Company
900 Fauquier Avenue — St. Paul 6, Minnesota
Attention Mr. Donald Opstad
Sustaining Organization Representative

Miro-Flex Company, Inc.
1824 East Second Street — Wichita, Kansas
Attention Mr. H. N. Carver
Sustaining Organization Representative

Portable Traffic Signals, Inc.
146 West 21st Street — Los Angeles 7, California
Attention Mr. W. W. Taylor
Sustaining Organization Representative

Prismo Safety Corporation
Huntington — Pennsylvania
Attention Mr. John C. Horn
Sustaining Organization Representative

Revere Corporation of America
Wallingford — Connecticut
Attention Mr. Walter K. Davies
Sustaining Organization Representative

Robbins Tire and Rubber Company
Tucumbia — Alabama
Attention Mr. Truman Robbins
Sustaining Organization Representative

The Streeter-Amet Company
4101 North Ravenswood Avenue — Chicago 13, Illinois
Attention Mr. George F. Graham
Sustaining Organization Representative

Traffic and Street Sign Company
84 Foundry Street — Newark 5, New Jersey
Attention Mr. Walter M. Schoenfeldt
Sustaining Organization Representative

Tuthill Spring Company
760 Polk Street — Chicago 7, Illinois
Attention Mr. H. T. Moore
Sustaining Organization Representative

Union Metal Manufacturing Company
1432 Maple Avenue, N. E. — Canton 5, Ohio
Attention Mr. W. A. Porterfield
Sustaining Organization Representative

U. S. Porcelain Enamel Company
4635 East 52nd Drive — Los Angeles 22, California
Attention Mr. J. L. Hodgkinson
Sustaining Organization Representative

Wald Industries, Inc.
301 Penn Street — Huntingdon, Pennsylvania
Attention Mr. John R. Wald, Jr.
Sustaining Organization Representative

down from Providence to witness his inauguration. Besides **Ed Colby**, **John Logan**, and **Clint Adams**, all of whom work with him in Providence, **Roger** even brought along **Ed Johnson**, Providence purveyor of Automatic Signals.

Outgoing Section President **Earl Flynn** recently resigned as Traffic Engineer for Springfield, Mass. **Earl** is now associated with **Al Kaehrle** in consulting work at Hartford, Connecticut. In the meantime, **Tom Barlow**, Earl's aide-de-camp in Springfield is tending the traffic there.

Distinguished visitor at the New Haven meeting was **Mel Bierman.** Traffic Engineer for the Panama Canal Zone. Mel, former T. E. for St. Joseph, Missouri, also attended the Annual Meeting in Pittsburgh while on a seven week business and pleasure trip. To attract new pinochle competition to Panama **Mel** has magnanimously offered free passage through the canal for all ship-owning Institute members.

Bill McGrath, New Haven's intrepid Traffic Engineer, proudly announced the birth of a daughter, and the opening of the New Haven Pigeon Hole Loft for cars. The former has blue eyes. The latter has 304 spaces. Both are welcome additions.

Western Section escapee, now Traffic Engineer for the Eno Foundation, **Bob Schmidt,** has made another move to ease traffic congestion in the East. He traded his wife's Studebaker for a Volkswagen —a baby blue convertible yet!

Bob Jaffee is in this year's Yale Class. He's now getting a formal traffic education to go along with the practical one he acquired the past few years as a member of the Providence Traffic Engineering Dept., **Burt Rudy, Ken Crowley** and **Ernie Elliott** of Connecticut Highway Dept. are doing the same thing.

NEW YORK METROPOLITAN SECTION

Snipped from Metropolitan Section Newsletter, **Richard I. Strickland,** Editor.

Lincoln Tunnel Parking Lot

On November 1 the Lincoln Tunnel parking area located along N. J. Route 3 just west of U. S. Route 1 in N. Bergen, N. J. was opened. This 1100 car parking lot will offer express bus service to New York City through Lincoln Tunnel. It is the first such lot aimed at relieving cross-Hudson traffic by the provision of inexpensive peripheral parking. The lot was built by the Port of New York Authority and will be operated by Public Service Coordinated Transport.

New Expressways Open in N. Y. C.

On November 5th three expressway links in the New York City Expressway system were opened to traffic. The Major Deegan Boulevard, except for detouring around incompleted interchanges, was opened for its full length from Triborough Bridge to the New York City line where it will soon be connected to the New York Thruway. The Cross-Bronx Expressway was opened from Bruckner Boulevard to Bronx River Parkway. The Queens Midtown Expressway was opened from Connecting Highway to Queens Boulevard.

Buffalo's High Level Bridge Opens

Buffalo's High Level Bridge, spanning the Buffalo River and Ship Canal, was opened to traffic with appropriate ceremonies on October 19. This structure is approximately one and a half miles in length and cost in the neighborhood of $12,000,000. It is the first and most essential step in the development of a high-capacity arterial route into the city from the south.

The viaduct spans the harbor waterways with a 100 foot clearance, eliminating the necessity of traversing a tortuous surface route over narrow streets and bypassing two lift bridges. The roadway is 4-lane divided, with a 5-foot raised central divisor. At the northern end a traffic interchange with the Niagara Section of the New York State Thruway and the City's downtown streets is now being rapidly advanced and should be completed some time in 1956.

SOUTHERN SECTION

The City of New Orleans was well represented at the ITE meeting with the attendance of **Paul Ristroph**, Director of Utilities, **Johnny Exnicious**, Assistant Traffic Engineer (also proud father of 5-month-old son) and **Earl George**, student at the Yale Bureau. **Kenneth King**, Lt. Col. (RES) in the Marine Corps, was currently on temporary military assignment. All are presently busy planning ahead for new traffic problems anticipated with the opening of a new bridge connecting New Orleans with Algiers. A contract was recently let for this bridge at a cost of $62,000,000 and it will be the lowest crossing on the Mississippi River.

Marble Hensley's secret talents were exposed at the Pittsburgh meeting in that he consistently placed high in the Steel Casino games. At last report he was still undecided as to whether to take the radio or coffee maker prize. Tough decision! **Marble** reports favorable public acceptance of a new cycle selector system for the Chattanooga business district. This system includes 50 intersections, all with double signal indications (center and right side).

Congratulations to **Fenton Jordan**, Traffic Engineer of Norfolk, Virginia, on being elected President of the Hampton Roads Engineers Club. Also, upon taking on additional duties and functions including the design, construction, maintenance and traffic control of all city streets. Understand Norfolk is experimenting with a new use of colored route markers—ie, one for a bridge route, another for ferry route, etc. This is in conjunction with an "umbrella" system of one-way streets which was installed some nine months ago, apparently with great success.

Bill Mann reports that the City of Nashville has accomplished a forward step in mass transit with the completion of Memorial Square Transfer Station, a central bus station transfer point. All buses are routed by this station, which made it necessary to overcome many and varied bus routing and traffic regulation problems. Another sign of progress is seen in the soon-to-be-completed bridge across the Cumberland River, constructed on the same site as a Civil War Bridge.

Several section members have expressed interest in the outcome of the recent court suit involving the City of Atlanta with regards to advertising signs immediately adjacent to expressway right-of-way. The City had passed an ordinance prohibiting such signs within a certain distance of the right-of-way, declaring them a traffic hazard and nuisance. **Karl Bevins** reports that the case was thrown out of a local court but has been appealed to the State Supreme Court. In the meantime, the City has drawn up a revised ordinance.

Bill Derrick has recently circulated a proposed manual on standardizing construction signs (Detour, Barricade markings, etc.). There has long been a need for such a manual in both the city and highway traffic field, and this project warrants support of all. Further information may be obtained by writing **Bill Derrick**, Georgia Highway Department in Atlanta.

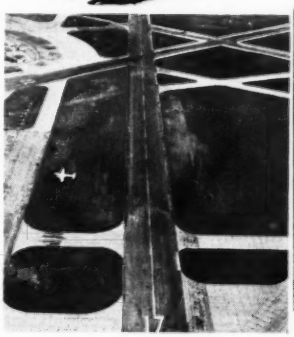
Jack W. Chambliss
Associate Editor

"CRYSTALEX"

A Molten Plastic when applied - Ready for HEAVY TRAFFIC 3 minutes Later.

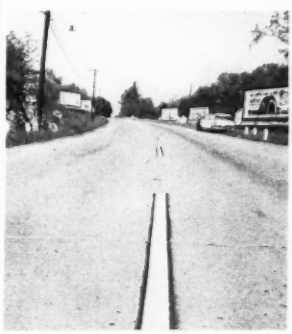
A LIVING LINE AT NIGHT

WHITE - YELLOW - RED - BLACK



Philadelphia International Airport
View of "Crystalex" Runway Markings.

Crystalex on the Avus, Berlin laid by Kasika Chemische Fabrik GMBH, Crystalex Licensees for Germany.



"Crystalex" Lines (underlaid with black "Crystalex") on concrete at Poughkeepsie, New York State, laid October 1954; photographed August 1955.

WHAT IS CRYSTALEX??—

Crystalex is not a paint. It is not nailed, glued, or imbedded in the surface. It is a thermoplastic compound applied in a molten state at a high temperature to form a continuous line of any desired length or width.

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WASHINGTON, D. C., SECTION

Clipped from the Washington, D.C. Newsletter, **C. C. Robinson**, Editor.

Ken Smith was awarded the much coveted prize for best attendance—at the Prismo Suite. The prize, a bathmat suitable for framing, will be a handy addition to Ken's trophy room.

The October meeting of the Washington Section, was held at the Cosmos Club and attracted 27 members and guests. CARL SAAL presented an illustrated talk based upon BPR research in the field of truck brakes and braking characteristics.

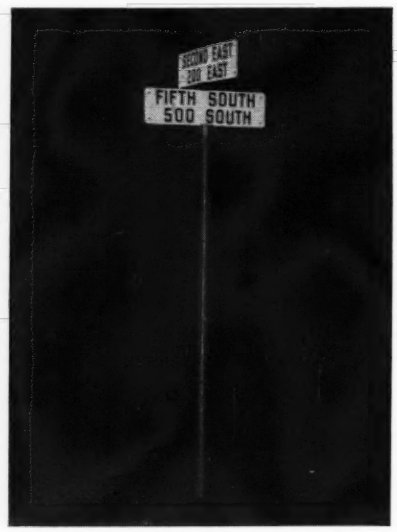
At D (for discharge) Day plus 45 all of Capitol Transit's erstwhile traffic engineers are securely situated.

(Continued on page 188)

Strictly Business

Salt Lake City Launches Program of Reflectorized Street Name Signs

Twenty thousand street name signs in Salt Lake City, Utah, will be reflectorized in a new program which ultimately will result in the reflectorization of nearly all the city's traffic control signs.



According to Joe L. Christensen, streets and public works commissioner, the street name signs—black letters on a background of silver "Scotchlite" brand reflective sheeting — will be reflectorized in the city's sign shop established in the room prevously used for the assembly of purchased signs.

By the end of 1955, officials expect to have about 1,000 new reflective street name signs erected in the rapidly expanding residential areas. In time, the commissioner said, all of the city's 20,000 street name signs will be reflectorized.

All the reflective street name signs are being produced in a 4-by-6-foot vacuum applicator in which the reflective sheeting is bonded to the metal sign blank. The plastic letters are applied to the surface of the reflective sheeting in the same applicator.

New street name signs will be backed with 61S-T6 aluminum blanks. Old nonreflective street name signs will be reclaimed and given new reflective faces.

Application of Television To Traffic Engineering

Unscrambling traffic pile-ups at various lanes or stations of a toll highway, tunnel or bridge can now be accomplished from a central headquarters with the flick of a dial and no need for helicopters or scouting teams.

The new miracle is not "done with mirrors" but with the magic of an exclusive closed circuit television system developed by Taller & Cooper, Brooklyn engineering specialists responsible for the toll equipment used on practically all of the world's major pay-as-you-drive installations constructed during the past quarter-century.

Taller & Cooper's wired television cameras may be placed in any number of remote, inaccessible or hazardous locations and one or all of the cameras can be controlled by changing the switches on the monitor dial at the viewing point.

Cameras situated at different points may send their picture signals to a single receiver, or to several receivers, also located at different points. Or a single camera may be set up to send its picture to an unlimited number of receivers in separate supervisory or executive offices.

In a four-lane tunnel system, for example, four cameras may be set up, one focused on each exit or entrance, and all sending their signal to a single receiver at a remote traffic control point. From the monitor dial, the supervisor may switch from one channel to the other to obtain a complete televised survey of the traffic conditions at each of the four points. Or on a Throughway where proper classification of vehicles is essential for proper toll charges, the supervisor may move the camera in for a close-up of the attendant on duty as he punches the classifications on each ticket validater.

Essentially this is an adaptation of televised controls already in use in many industrial operations from oil refineries and steel mills to department stores. What makes the Taller & Cooper system unique is the fact that the cameras are automatically adjustable to varying focus or changing light conditions by means of the single control panel at the viewer's own disposal.

Focal length of the lenses may be varied from close-up to long shot by the turn of a dial on the monitor. The camera may be rotated in two planes or "panned" from point to point by turning other switches. An automatic "iris" control within the camera adjusts the lens aperture to changing light conditions.

Small and compact, the Taller & Cooper television camera is a complete TV station in itself. It contains, besides the camera proper, everything necessary for transmitting a picture over the coaxial cable which connects it to the monitor. Included are the picture-pick-up tube and amplifiers, a modulating-oscillator and synchronizing generator.

The initial operating range of 500 feet may be readily expanded with the use of boosters. A wide choice of standard 16mm. movie lenses of different focal lengths and f stop numbers can be used by the camera, according to light conditions, distance of camera from object and size of image desired.

Safe Winter Driving Facts

The Committee on Winter Driving Hazards of the National Safety Council recently announced publication of the Fourth Edition of a facts booklet which provides information regarding the hazards of wintertime driving.

Entitled "It's Your Responsibility", this booklet is directed to the average driver of a passenger car, whether he drives for business or pleasure. It is designed to sweep aside the guesswork and misinformation that causes many winter driving accidents, replacing them with safety-sure know-how. An understanding of the causes of cold weather accidents is a driver's greatest protection against winter driving dangers.

In cold weather months, traffic accidents show a sharp rise in frequency and fatality. This booklet is packed with the facts and information that can serve as a driver's strongest shield against winter's deadly tricks. Summarizing the findings of intensive tests on vehicles, tires and automotive equipment in conditions of extreme cold, ice, snow and slush, it offers lessons in staying alive, presenting them in understandable, pic-

"Crouse-Hinds 12" Signals helped cut accidents in half at our most dangerous intersection."

. . . says Police Supt. A. G. Kendall of Fredericksburg, Virginia

"**U.S. 1A** as it passes through Fredericksburg is probably Virginia's most heavily traveled highway," says Superintendent Kendall. "The intersection at Fall Hill Avenue has had the highest accident rate of all intersections in the city of Fredericksburg.

"During the year preceding the installation of new Crouse-Hinds 12" Signals, the accident rate at this intersection had risen to an alarming average of 1.36 accidents per month . . . including one fatal accident.

"During the 9 months following the installation, the accident rate at this intersection has been lowered to .66 accidents per month. This is a reduction of 51.5%.

"I would say that a vital part in this reduction was played by the greater visibility of Crouse-Hinds 12" Signals."

More than 32 cities in the U.S. and Canada have ordered installations of these giant signals in less than a year. Actual performance has proved them to be:

- ★ **Four times brighter than conventional signals**
- ★ **Easily visible over a mile away under normal conditions**
- ★ **Easily fitted into existing systems at practical cost**

For full information call the nearest Crouse-Hinds office shown below

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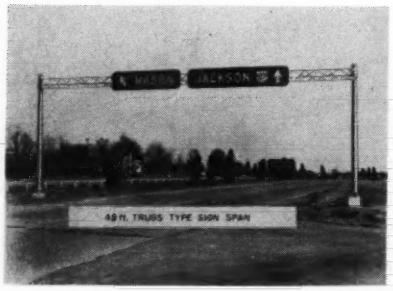
FLOODLIGHTS • CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING

All Aluminum Over Head Signs

A new sign span is being produced by Pfaff & Kendall, Newark, New Jersey, in which a new type of aluminum fabrication developed by the company



is being used. Supporting shafts are seamless, tapered all aluminum, with the span all welded of individual sections. The unit illustrated is 48-feet and has been tested under loadings of 60-lbs. per running foot and 105 mph wind loads. According to P. & K., this is the first time such construction has been utilized in all aluminum over-the-road spans. The result is a truly light weight, easy to install structure that is free from cumulative corrosion and subsequent weakening, plus a permanently attractive appearance with no need for painting. The inherent and structural flexibility of the new P. & K. spans is said to offer exceptionally high resistance to storm damage. Engineering data may be obtained from the manufacturer by writing the plant at 84 Foundry Street, Newark, New Jersey.

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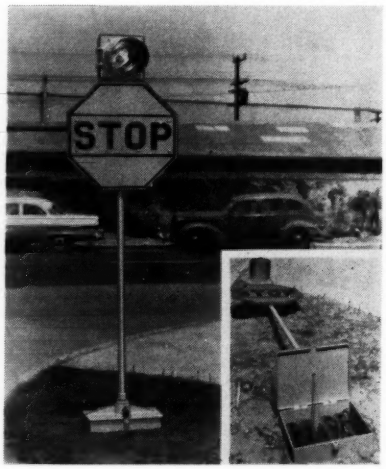
ture-clear words, with simple charts and drawings.

A companion piece, entitled "It's Up to You", is also available. It is written expressly for professional drivers of straight trucks and tractor-trailer combinations, who face fog, sleet, snow and ice as part of the day's work. This booklet shows the driver that it's up to him to come safely through these hazards. It offers test-proven facts on winter driving techniques, including causes and prevention of jackknifing. This is vital information that will help even the surest of professional drivers to stay safe in the dangerous winter months.

Sample copies of these booklets may be obtained without charge by writing to the following address: Committee on Winter Driving Hazards, National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill. Prices for quantities will be sent on request.

Battery Operated Flashing Stop Sign Available

Neo-Flasher Manufacturing Co. of Burbank, California, formerly known as Light Products Inc., announces the in-



troduction of Model No. 5-100 standard 8⅜″ lens, "Stop and Caution", battery operated, flashing light. The Neo-Flasher 5-100 was designed by the manufacturer to control traffic where the high cost of wiring has heretofore prevented installation of a flashing, warning light. For example, a flashing "Dangerous Curve" sign can be installed where power is not available, a flashing "Stop or Caution" sign can be installed at intersections, formerly unprotected against accidents, or sign may be used to indicate narrow passages, bridge abutments or dead end streets. The Neo-Flasher 5-100 is constructed with cast iron battery case. Sign standard screws into the hinged lid of the battery case for easy access. The battery case is bolted to a concrete foundation by use of 4 screws. The hinged lid makes changing of the battery quick and easy for recharging. A lock can be provided for insurance against vandalism.

The 5-100 is completely weatherproof and economical to operate. Four ignition dry cell batteries will operate Flasher for approximately one year. The unit can be installed for one-fourth of the cost of a conventional wired installation. Visibility rating is well over one mile. It is equipped with a visor for better concentration of the light beam. It is available with various flash rates, although in most cases the 120 flashes per minute is most desirable. The standard 8⅜″ lens is available in red for "Stop" and amber for "caution". The exterior case dimension is 10½″ square. The 5-100 is equipped with gas vapor tube and will never burn out. It is constructed of aluminum housing and hinged door.

For further information write to: Neo-Flasher Manufacturing Co., 3210 Valhalla Drive, Burbank, California.

Urban Development Guidebook Published

How to meet the critical city problems of congestion, blight and failure to use tax resources are set forth by the Chamber of Commerce of the United States in a new publication, "Urban Development Guidebook."

The guidebook was developed largely from material obtained last year in urban development conferences sponsored by chambers of commerce in six cities with outstanding development programs.

The conferences made clear the need for an over-all approach to problems of community growth and change, the guidebook reports.

To attain this coordination, the guidebook recommends establishment of local urban development teams which include representatives of all segments of society.

"Such an urban development team," the guidebook says, "can provide the driving force necessary to plan and carry out a broad-scale attack on urban problems. It can provide, also, the public understanding and support required by local officials and agencies in developing a comprehensive program of action."

The guidebook analyzes the three chief problems confronting the nation's cities — congestion, blight and sharply increased city government expenses.

"These problems of adjustment," it says, "would be alarming if it were not for the capacity of civic-minded citizens to face and solve problems which at first seem insurmountable."

The urban conferences on which the guidebook was based were held in Birmingham, Ala.; Columbus, Ga.; Dayton, Ohio; Houston, Texas; Sacramento, Cal., and Worcester, Mass. An urban development team, provided by the National Chamber, explored community problems with local civic leaders.

The guidebook may be obtained from the Chamber of Commerce of the United States, Washington 6, D. C. Price is $1 for single copies and 50c each for three or more copies.

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ASSISTANT TO CITY TRAFFIC ENGINEER

Excellent opportunity for man willing and able to handle increasing technical and administrative responsibility in an expanding organization. Periodic salary increases and other Civil Service benefits. Examinations planned for early 1956. Opening may be at either the Assistant level ($459-$549—requires college graduation plus two years' experience), or at the Senior Assistant level ($517-$617—requires college graduation plus four years' experience and professional registration).

Submit outline of education and experience to:

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City Traffic Engineer
274 City Hall
St. Paul 2, Minnesota

CITY OF COLORADO SPRINGS COLORADO

PLANNING AND TRAFFIC ENGINEER

To organize and supervise an overall planning program and a traffic planning program.

REQUIREMENTS: Equivalent of graduation from a college of recognized standing with four years' experience in city planning including one year as a principal planner, one year of general administrative experience, and one year as an analyst in traffic engineering.

SALARY: $5460 to $6516 per year.

APPLY:

Personnel Director
City Hall
Colorado Springs, Colorado

H. K. FERGUSON COMPANY CLEVELAND, OHIO

ASSISTANT TRAFFIC ENGINEER

REQUIREMENTS: Graduate Engineer with a minimum of three years traffic engineering experience with at least one year in parking surveys and reports. Must be willing to travel to cities in the U. S. and Canada.

SALARY: $6000 to $7000 annually dependent upon age and qualifications.

Write:

Eugene A. Barton
Senior Traffic Engineer
The H. K. Ferguson Co.
Ferguson Bldg.
Cleveland 14, Ohio

CITY OF CINCINNATI

ASSISTANT UTILITIES ELECTRICAL ENGINEER

As second man in design, operation, and maintenance of city-wide program of street lighting and traffic signals, and other related work.

REQUIREMENTS: Electrical engineering degree with experience in traffic signal or street lighting work, or allied experience.

SALARY: $6375 to $7169 a year. Excellent fringe benefits, including retirement plan.

Write:

W. D. Heisel
Personnel Officer
Room 260 City Hall
Cincinnati 2, Ohio

CITY OF WICHITA KANSAS

TRAFFIC ENGINEER

To direct activities of Traffic Engineering Division under the Director of Service. Functions include traffic studies, installation and maintenance of traffic control devices, including parking meters and administration of street lighting program. Nineteen citizen member Traffic Commission to work with.

MINIMUM REQUIREMENTS: Engineering degree and basic knowledge of traffic engineering.

SALARY: $545 - $655 per month. Fringe benefits include local and Social Security Retirement, vacation, sick leave, etc.

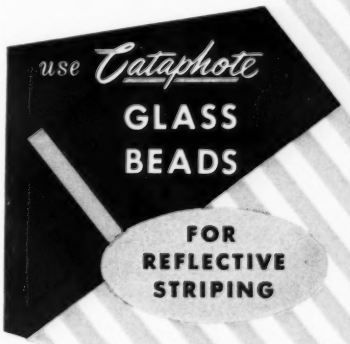
Apply:

George J. Fisher
Director of Service
Room 205, City Building

don't let

NIGHT

hide your stripes!



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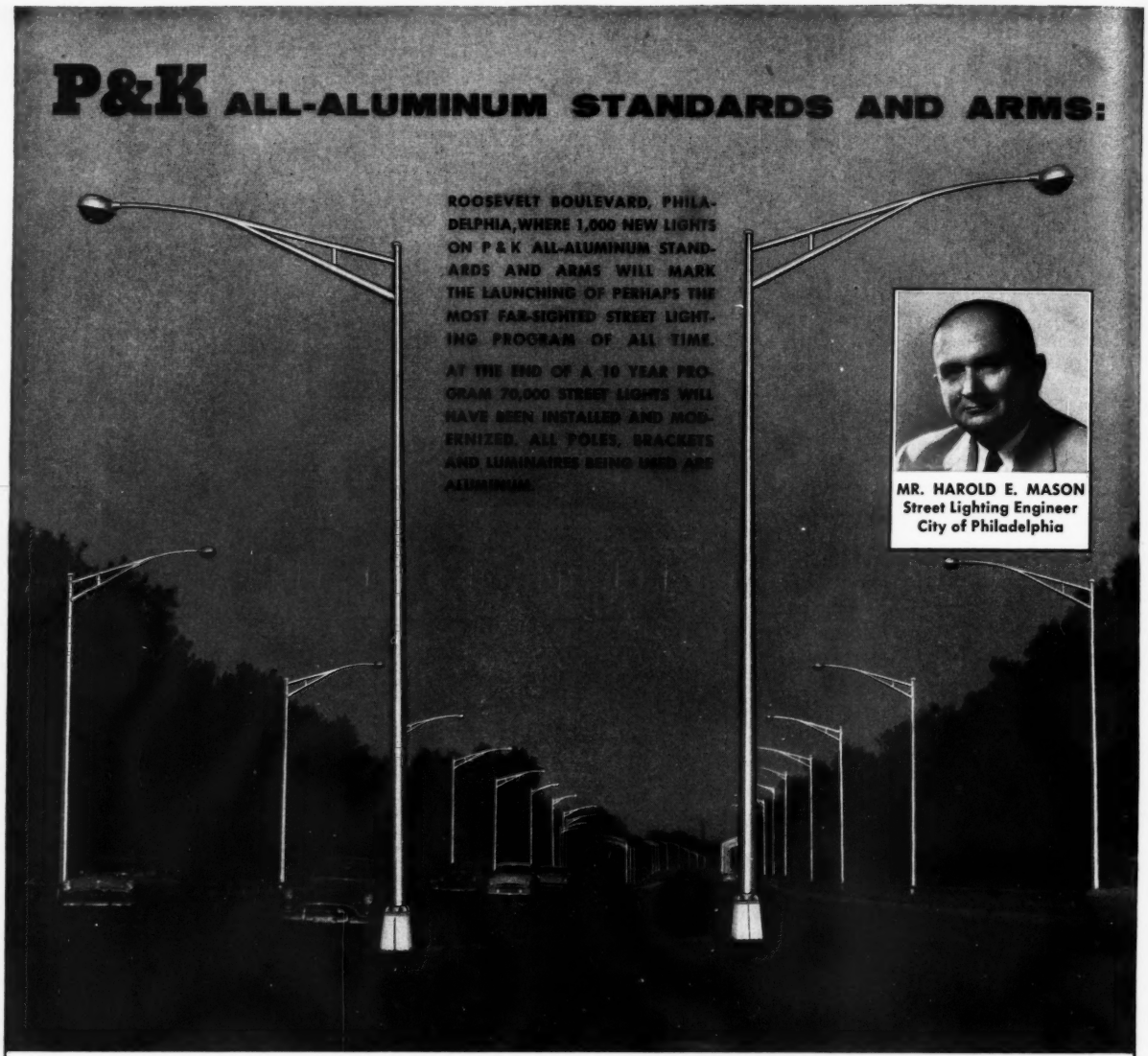
- CATALINE REFLECTIVE STRIPING
- CATAPHOTE REFLECTIVE BEADS

P&K ALL-ALUMINUM STANDARDS AND ARMS: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AT THE END OF A 10 YEAR PROGRAM 70,000 STREET LIGHTS WILL HAVE BEEN INSTALLED AND MODERNIZED. ALL POLES, BRACKETS AND LUMINAIRES BEING USED ARE ALUMINUM.
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Street Lighting Engineer
City of Philadelphia

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Newark 5, New Jersey

OBITUARY

Robert J. Ratner

Robert John Ratner (Assoc. Mem., ITE), Highway Engineer with the Rader Engineering Company, died November 21, 1955, at his home in Coral Gables, Florida, after a long illness. The November issue of TRAFFIC ENGINEERING, which was distributed just after his death, carried an article, "A Study of Multilane Crown Design", written by Mr. Ratner. He had worked for the Miami firm of consulting engineers since 1954.

Born in New York City December 3, 1926, he graduated from that city's Fieldston High School in 1944, and immediately entered the Navy V-12 Program at Cornell University. He received a commission in the Naval Reserve and his degree in Civil Engineering in 1948. Following his graduation he accepted employment with the California Division of Highways as a Junior Engineer in the Freeway program. During the next five years he advanced to Assistant Highway Engineer and was involved in the planning, design and construction inspection of the Freeway system in the Los Angeles area. In July 1953 he resigned to enter the employment of consulting engineering firms on the West Coast until he moved to Florida to join the Rader Company in April 1954. He remained active in the Naval Reserve as a Lieutenant j.g. until his death.

In addition to the Institute of Traffic Engineers, Mr. Ratner held membership in the American Society of Civil Engineers, the Society of American Military Engineers, and the Highway Research Board. He was registered by the states of Florida and New York as a professional engineer.

He is survived by his widow, the former Susanne M. Kauffman, of Beverly Hills, California, to whom he was married February 3, 1954, his parents, Richard J. Ratner and Mrs. Blanche D. Ratner, and a sister, Audrey Rand, all of New York.

Membership Applications

The following applications have been received since the list of applicants published last month.

APPLICATIONS FOR TRANSFER

ANDREWS, Basil R.
Engineer, Traffic Division
Public Works Dept.
Contra Costa County
Martinez, Cal.
November 22, 1955 for ASSOCIATE grade

CAMPBELL, E. Wilson
Chief Traffic Engineer
Chicago Area Transportation Study
160 N. LaSalle, Rm. 1804
Chicago, Illinois
December 14, 1955 for ASSOCIATE grade

CORGILL, William E.
Traffic Engineer
Association of Casualty and Surety Companies
60 John Street
New York 38, New York
November 15, 1955 for ASSOCIATE grade

COX, Robert L.
Graduate Student
University of Illinois
Urbana, Illinois
December 12, 1955 for ASSOCIATE grade

FREDERICKSON, Charles B.
Assistant Traffic Engineer
Traffic Engineering Division
Engineering Dept., Room 502, City Hall
Long Beach, California
December 14, 1955 for ASSOCIATE grade

KUPEL, Vernon T.
Engineer, Bureau of Traffic
Highway Office Building
Carbondale, Illinois
December 1, 1955 for ASSOCIATE grade

OVERMYER, Richard A.
Assistant Traffic Engineer III
Bureau of Traffic Engineering
Room 1005, City Hall Annex
Philadelphia, Pennsylvania
November 17, 1955 for MEMBER grade

RUDDEN, James B.
Assistant Traffic Engineer
City of Baltimore
413 St. Paul Place
Baltimore 2, Maryland
November 30, 1955 for ASSOCIATE grade

STRICKLAND, Richard I.
Assistant Chief, Traffic Authority Div.
The Port of New York Authority
111 Eighth Avenue
New York 11, New York
November 15, 1955 for MEMBER grade

(Continued on page 188)

Yearbook Changes

ABBING, Aart L. R. (Junior)
Traffic Engineer, Royal Netherlands Automobile Club, 4 Sophialaan, The Hague, The Netherlands.

BREEDING, Harold A. (Associate)
Supervisor, Electrical, Mechanical & Chemical Testing, Outdoor Lighting Lab., General Electric Company, East Flat Rock, Hendersonville, North Carolina.

BUCKMAN, T. Robert (Member)
Traffic Engineer, 950 Jennings Street, Forth Worth, Texas.

BURNS, Harry F. (Associate)
Traffic and Municipal Engineer, A. D. Margison & Associates, Ltd., 30 Eglington Avenue E., Toronto 12, Ontario Canada.

CAMPBELL, E. Wilson (Junior)
628 Mitchell Avenue, Elmhurst, Illinois.

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HAMPTON, William B. (Associate)
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HANSEN, Robert J. (Associate)
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OLCOTT, Edward S. (Junior)
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SKILES, Gerald W. (Associate)
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SYREK, Daniel (Associate)
Data Reduction Specialist, Air Pollution Control District. SEND MAIL: 2424½ Loma Vista Place, Los Angeles 39, California.

THOMAS, William L. (Associate)
Assistant Traffic Engineer, Traffic Engineering Department, 311 City Hall, Atlanta, Georgia.

WILLIAMS, Leslie (Member)
Traffic Copsultant, 30 E. Sunset Avenue, Philadelphia 18, Pennsylvania.

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SECTION NEWS

(Continued from page 181)

Warren Adams has taken a position with B.P.R., doing, at present, an analysis of traffic movements during the late lamented strike. **Burt Sexton** has opened shop, complete with mechanical secretary, as traffic consultant extraordinary, ("have tux—will travel").

Joe Lo Jacono now holds forth with the Bureau of Vehicles and Traffic, under **John Mitton, John,** incidentally, has been named to the I.T.E. membership committee, replacing **Gordon Gravelle,** who was kicked upstairs to Institute Director.

MEMBERSHIP APPLICATIONS

(Continued from page 187)

VICK, Alfred III
Associate Traffic and Planning Engineer
Virginia Department of Highways
1221 E. Broad Street
Richmond 19, Virginia
December 5, 1955 for ASSOCIATE grade

PETERSON, Vernon H.
Junior Traffic Engineer
Bureau of Traffic, Room 274, City Hall
St. Paul 17, Minnesota
November 28, 1955 for JUNIOR grade

SHOCKEY, Jack Whitson
Associate Traffic Engineer
City and County of Denver
Room 480, City and County Building
Denver, Colorado
November 21, 1955 for JUNIOR grade

THORPE, Vernon R.
Public Works Director and Chief Engineer
City of Medford, City Hall
Medford, Oregon
November 28, 1955 for ASSOCIATE grade

WARNBERG, Donald R.
Assistant Supervisor
Traffic Regulation and Control Unit
Colorado Department of Highways
4201 East Arkansas Avenue
Denver 22, Colorado
December 12, 1955 for ASSOCIATE grade

WILLIFORD, Robert E.
Traffic Safety Engineer
Office of City Traffic Engineer
Department of Streets
Room 1002, City Hall Annex
Philadelphia, Penna.
December 9, 1955 for ASSOCIATE grade

NEW APPLICATIONS

BOSSI, Alfred A.
Assistant Traffic Engineer
County of Alameda
12th and Fallon Streets
Oakland, California
December 12, 1955 for JUNIOR grade

BROWN, James Lee
Traffic Signal Engineer
Room 480, City and County Building
Denver, Colorado
November 28, 1955 for JUNIOR grade

GALIOTO, Anthony J.
Planning Technician
Port of New York Authority
111 Eighth Avenue
New York 11, New York
November 30, 1955 for JUNIOR grade

LEITCH, Kenneth
Traffic Engineering Assistant
Melbourne City Council
Town Hall
Melbourne, Victoria, Australia
November 22, 1955 for JUNIOR grade

LOTSPEICH, Marvin W., Jr.
Assistant Traffic Engineer
451 City Hall
Spokane, Washington
November 21, 1955 for JUNIOR grade

MANNING, John I.
Assistant Traffic Planning Engineer
Room 1006, City Hall Annex
Philadelphia, Pennsylvania
December 5, 1955 for JUNIOR grade

MILLER, John V., Jr.
Highway and Traffic Engineer
Richardson, Gordon and Associates
1411 Walnut Street
Philadelphia 2, Pennsylvania
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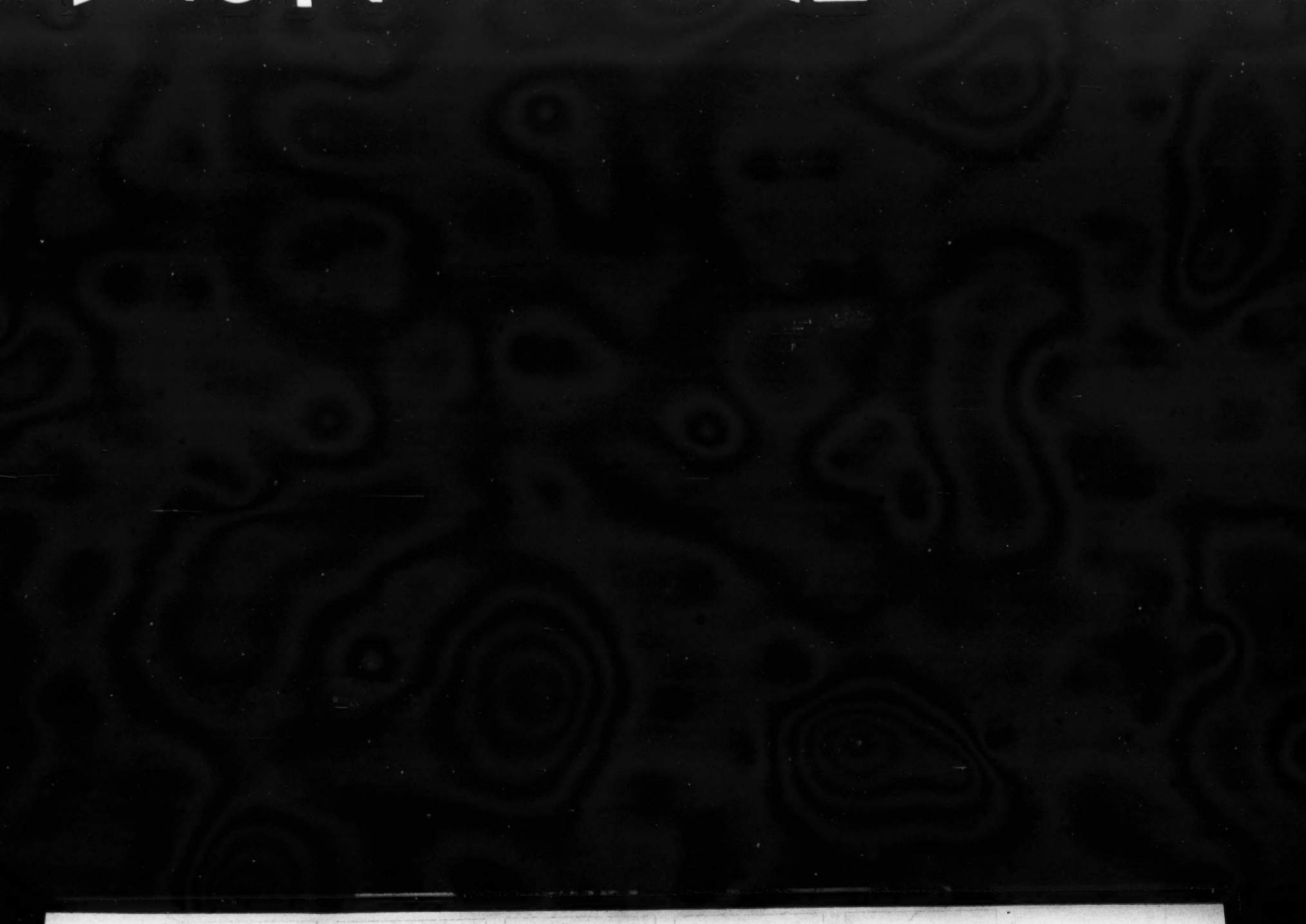
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